LIBRARY

SEP 3 1985

National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii

REVIEW OF THE STATE OF WORLD FISHERY RESOURCES

by

Marine Resources Service
Fishery Resources and Environment Division
Fisheries Department

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, March 1985

PREPARATION OF THIS DOCUMENT

This document, using statistics up to 1983 and including information for 1984, is the biennial review of the state of the world fish stocks prepared by the Fishery Resources and Environment Division for presentation to FAO's Committee on Fisheries (COFI), and given wide circulation to interested institutions. It has been prepared on the basis of literature available throughout the world, but individual references are not given as the resulting bibliography would be very long.

ABSTRACT

The paper continues the regular reviews of the state of fish stocks, based mainly on statistics for 1982 and 1983 and in some cases, on data reported for 1984. The introduction refers to the slow increase in world fish production of marine fish and shellfish, draws the attention to a number of recent changes in fisheries development and management, briefly reviews the conclusions of the FAO World Conference of Fisheries Management and Development and revises a number of important problems concerning the quality of fishery statistics. The rest of the document provides a review of the state of stocks in the main statistical marine and inland areas, as well as a review concerning oceanic tunas and billfishes.

W/M8402

For bibliographic purposes this document should be cited as follows:

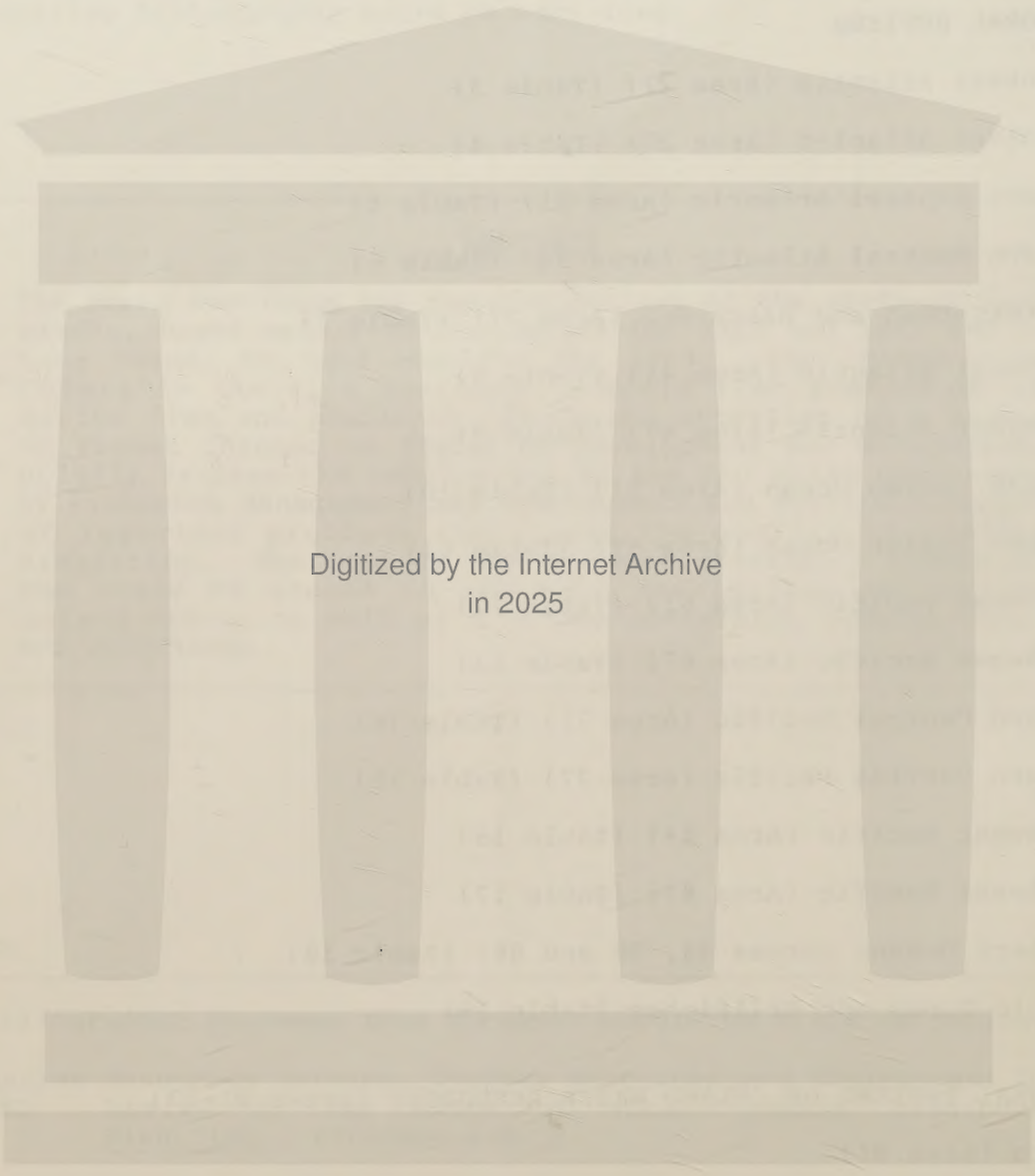
FAO, Marine Resources Service, Fishery Resources and Environment Division, 1985 Review of the state of world fishery resources. FAO Fish.Circ., (710)Rev.4:61 p.

FAO Fisheries Circular (FAO Fish.Circ.)

A vehicle for distribution of short or ephemeral notes, lists, etc., including provisional versions of documents to be issued later in other series.

TABLE OF CONTENTS

		Page
A.	INTRODUCTION	1
	FAO World Conference on Fisheries Management and Development	3
	Fisheries Statistics and the Assessment of the State of the Stocks	3
B.	REGIONAL REVIEWS	4
	Northwest Atlantic (Area 21) (Table 3)	4
	Northeast Atlantic (Area 27) (Table 4)	6
	Western Central Atlantic (Area 31) (Table 5)	10
	Eastern Central Atlantic (Area 34) (Table 6)	11
	Mediterranean and Black Sea (Area 37) (Table 7)	13
	Southwest Atlantic (Area 41) (Table 8)	14
	Southeast Atlantic (Area 47) (Table 9)	16
	Western Indian Ocean (Area 51) (Table 10)	17
	Eastern Indian Ocean (Area 57) (Table 11)	19
	Northwest Pacific (Area 61) (Table 12)	20
	Northeast Pacific (Area 67) (Table 13)	22
	Western Central Pacific (Area 71) (Table 14)	25
	Eastern Central Pacific (Area 77) (Table 15)	27
	Southwest Pacific (Area 81) (Table 16)	28
	Southeast Pacific (Area 87) (Table 17)	29
	Southern Oceans (Areas 48, 58 and 88) (Table 18)	31
	Oceanic Tunas and Billfishes (Table 19)	31
C.	REGIONAL REVIEWS OF INLAND WATER RESOURCES (Areas 01-07)	33
	Africa (Area 01)	34
	North America (Area 02)	34
	South America (Area 03)	35
	Asia and the Pacific (Areas 04 and 06)	35
	Europe and USSR (Areas 05 and 07)	35
D.	AQUACULTURE (FRESHWATER, BRACKISH AND MARINE)	35
TABLES		38



Digitized by the Internet Archive
in 2025

https://archive.org/details/fao-fisheries-and-aquaculture-circular_1985-03_710-revision-4

A. INTRODUCTION

During the two years since the last review, recorded world landings of marine and freshwater fish increased 2.3%, but all the increase occurred in 1982, with no further increase in 1983. Inland fishery landings increased 3.7% in 1982 and 5.9% in 1983, but the increase in 1983 of 500 000 tons was offset by a reduction of the same amount in the landings of Peruvian anchoveta (see Table 1 and Fig. 1). The slow but steady average increase in total world landings of approximately 2% per year over the last five years masks the considerable number of much larger percentage changes in recorded landings of individual species or species groups, which are described in the area reviews.

The downward trend of catches by vessels fishing at long range, off the shores of other countries, has continued. Table 2 records these changes for four areas and it is seen that while in the Northwest Atlantic the catches by long-range vessels have fallen from over 50% of the catches from the region ten years ago to less than 10% in 1983, the catches of long-range vessels in the East Central Atlantic, Southeast Atlantic and Northeast Pacific have only fallen a little and still account for over 50% of the landings from these areas.

As more countries become directly involved in fisheries management following the establishment of their exclusive economic zones, the work of regional fisheries bodies has been changing to give emphasis to shared stocks in place of international fisheries and their momentum has been increase. Their subsidiary bodies provide information on the state of the stocks and formulate recommendations for management policies. Many of these regional fisheries bodies are referred to in the regional reviews, but for a comprehensive account of these bodies and their work, the reader is referred to the paper "Activities of regional fishery bodies and other international organizations concerned with fisheries", issued as COFI/5/Inf.6.

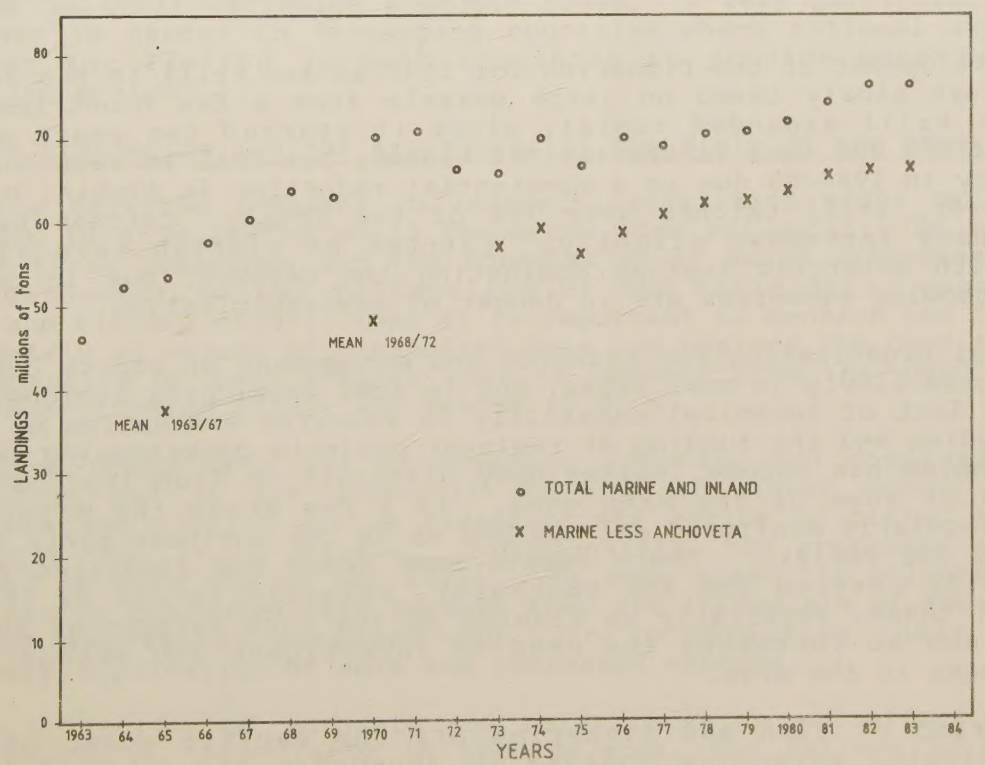


Fig. 1 Annual world landings of aquatic resources (excluding mammals and plants)

The large changes that have taken place in the relative abundance of the smaller pelagic fish species around Japan in recent years are of considerable interest and importance. While the catches of Japanese sardine, which had fallen to 9 000 tons in the mid sixties have now risen to over 4.2 million tons, the catches of some other small pelagic fish in the area have fallen, and the total catch of six small pelagic species of the area has remained more or less constant. This adds another example of the apparent dynamic balance between species that would appear to be much more common than was previously believed to be the case.

The importance of the variability of fish stocks was discussed at some length in the last "Review of the state of world fishery resources" (Rev.3) of June 1983 and it is increasingly evident that the administrator who has to look ahead in his choice of management strategy must keep this in mind.

The seaweeds are not covered by the regional reviews in this report, nor are they are included in the total production figures (Fig. 1 and Table 1). Reported annual world production of seaweeds for food and as a source of raw material for the chemical industry has been around 3 million tons since 1978, of which some 75% are brown seaweeds. The total is probably considerably under-reported, as are probably the figures for the harvest of artisanal and intertidal catches in general. There is increasing recognition of the important role that seaweeds play at the base of the food chain and as shelter for many animals and there is an urgent need for biological and fishing data to permit these resources to be properly managed.

The review of the inland fisheries and aquaculture shows that there has been an overall increase in fish production from inland waters of some 20% over the last six years, in spite of decreases in some areas due to degradation of the environment and pollution. Of this production 60% continues to come from Asian countries and to be largely the product of aquaculture. The total production of aquaculture of all kinds, in fresh, brackish and salt water, has continued to grow at an average rate of about 7% per year, reaching a total of over 8 million tons in 1983 (including molluscs).

The development of the fisheries for finfish and krill in the southern seas continues slowly based on large vessels from a few countries. The fishery for krill expanded rapidly since it started ten years ago and reached over 500 000 tons in the 1981/82 season, but fell to less than half this quantity in 1982/83 due to a substantial reduction in fishing by USSR, which, however, still catches over 75% of the total. Catches by other countries have increased slightly. Catches of finfish have slightly increased with Antarctic icefish dominating the catches, but in general, these slow growing resources are in danger of overexploitation.

Regional organization for research and management of stocks continues to be developed slowly in most areas, but in some developing regions, there is a severe lack of technical capability in resource evaluation or socio-economic studies and the funding of regional projects backstopping Regional Fisheries bodies has become increasingly difficult to find leading to the termination of some of the main ones. In a few areas the majority of stocks are regularly monitored and managed as in the northern parts of both the Atlantic and Pacific. There remain some areas and fisheries not yet satisfactorily covered and the Southwest Atlantic is one of the most important of these, especially as fishing on the rich Patagonian Shelf is increasing and so increases the need to investigate and manage trans-boundary stocks in the area.

Monitoring of fish and fisheries off the Pacific coast of South America indicates extensive changes in abundance and distribution of several stocks of small pelagic fish, resulting from environmental changes caused by the recent "El Niño" phenomenon. Distribution and abundance of

sardine, jack mackerel and chub mackerel, as well as anchoveta, were all affected to a greater or lesser extent in one way or another and led to changes in the fishing patterns in Ecuador, Peru and Chile. These changes are of great importance to these countries as the catches of these four pelagic species make up more than 90% of the total catch in the area.

FAO World Conference on Fisheries Management and Development

The need for the successful management and development of fisheries was thoroughly reviewed during the 1984 World Fisheries Conference, and it endorsed a "Strategy" containing guidelines and principles for management and development as well as adopting five associated "Programmes of Action".

The Strategy itself is a comprehensive statement, bringing out the importance of fisheries in fulfilling economic, social and nutritional needs and dealing with every aspect of fisheries management, with special emphasis on small-scale fisheries and the need to raise the economic and social level of the fishermen and their families. It also deals at length with the needs of research, including adequate facilities and statistical data, and the need of management, with particular emphasis on training at all levels of scientific and managerial staff. The importance of international cooperation in resource assessment, the working out of management options, and the formulation and implementation of management policies was stressed.

There is a worldwide requirement for adequate data on resources and their exploitation, namely, accurate fishery statistics and biological data necessary for continuous monitoring of the state of stocks. This is particularly relevant when one considers the continuous degradation of the quality of statistics in many areas, the amount of investments already made and still planned in fisheries development, the natural fluctuation in the abundance of many species, the important changes in species composition and abundance that can result from fishing pressure, and the increased needs for accurate information by coastal countries for the management of the resources in their exclusive economic zones. A very particular effort in this sense is needed in developing countries where national expertise is still far too limited in most instances to provide governments with appropriate advice.

Fisheries Statistics and the Assessment of the State of the Stocks

While detailed comments on improving statistics might be considered irrelevant in a review of world resources, the reliability of the assessments of these resources and the formulation of sound management policies are so dependent on the reliability of the basic data, especially on catches and fishing effort, that it is important to mention the topic here. Unfortunately no amount of biological data can replace the need to know the actual quantity of each species that is removed from the stock each year and how much fishing effort was needed to do so.

Unless these data are of adequate accuracy and completeness, the biologist is put in the untenable position of either making unreliable assessments and risking giving inappropriate advice or giving advice that is so vague that it is useless. Unfortunately, the pressures are usually sufficient to make him do the first. In some cases the scientists cannot use nationally collected data because they are incomplete or too unreliable for stock assessment purposes and turn to obtaining their own, with unnecessary duplication of work and increased expense.

The collection of adequate and reliable catch and effort statistics can be expensive, especially in archipelagos, but failure to manage the resources due to lack of sound information and advice will, in the long run, become more expensive. There are no short cuts which provide good

statistics, but the cost of getting what is essential for making reliable assessments of the resources can be greatly reduced by a recognition of what is essential in detail, what sampling is appropriate, and whether periodic censuses can, at least temporarily, replace more frequent observations. The devising of the most appropriate programme of statistics collection and, where appropriate, the transfer of the data to computer storage, requires considerable experience and is a field in which FAO is particularly competent in giving advice.

A comparison of national fisheries statistics and data used for assessments by regional bodies with the catch data that each national statistical office submits to FAO shows many discrepancies, some of which are substantial. This fact is also mentioned in some of the area reviews in this report and shows up a serious problem which needs to be investigated as a matter of urgency, to find ways of correcting it.

B. REGIONAL REVIEWS

NORTHWEST ATLANTIC (Area 21) (Table 3)

Total nominal catches in the region decreased from a little under 3 million tons in 1980-81 to about 2.68 million tons in 1982, indicating a relatively stable level of production. This reflects the fact that fisheries in the region have now adapted to the new legal regime, and that national mechanisms for managing resources of exclusive economic zones have improved considerably in the interval, and this has contributed to the relative stability of the overall catch despite fluctuations due to environmental factors. The trawl fisheries on the isolated Flemish Cap, and the extreme south-east corner of the Grand Bank are unusual in that they are among the very few places in the world where such fisheries still take place outside the control of any coastal state. The Northwest Atlantic Fisheries Organization (NAFO) is responsible for management of shelf and coastal pelagic resources beyond 200 miles in the northern part of the region, and has taken over the role of ICNAF for regulating the exploitation of marine resources in these areas, which, like resources within exclusive economic zones, are now generally managed at a level of effort below that yielding the maximum sustainable yield (MSY). These non-local fisheries are largely confined to those stocks (e.g., squids and silver hake) for which the coastal states have only a limited catching or marketing capacity. Altogether the four coastal states now account for 94% of the total catches from the region. Even the long-distance fishery for cod, which in one form or another, was for five centuries among the world's biggest fisheries, and which accounted for three-quarters of the total cod catch in the region only a decade ago, now accounts for only 12% of the total cod catch.

Fisheries of this region falling entirely within the exclusive economic zones of coastal states are managed nationally by means of a variety of mechanisms, perhaps involving bilateral consultation in the case of shared or boundary resources. However, the coastal states may decide to discuss questions of conservation for stocks falling wholly or partially outside the 200-mile limit in NAFO.

The $F_{0.1}$ [1/] criterion is the most commonly used management benchmark, both within and outside exclusive economic zones, which is considered to

---

1/ The level of effort at which the increase in catch produced by one additional unit of effort (marginal yield) is less than 1/10 of the catch rate obtained at very low levels of effort

generate greater benefits for the coastal state than the more traditional FMSY which implied that stocks had to be fished up to their maximum biological production. The more drastic measures which the greater powers of the coastal state have allowed them to introduce, have led to the recovery of some of the depleted stocks, particularly of cod. The haddock stocks on George's Bank have also recovered, following the end of the long run of very poor year-classes from 1963 onwards. However, recent year-classes were weaker, and landings in 1982 and 1983 declined significantly, to be compensated by increased catches of silver hake, yellowtail founder and ocean clams. Recovery of the very long-lived redfish stocks from periods of high exploitation may be expected to take longer than for other resources, but strategies of stock rebuilding are now being followed.

In some cases, e.g., of cod, the recovery of the stocks has been followed by increased catches. In other cases the coastal state has felt it desirable to be cautious. For example, though there seems to have been an increase in capelin, the experience of what now seems to have been over-optimistic estimates of potential catches around 1975, plus an awareness of the importance of capelin as food for larger animals, has discouraged moves to re-open large-scale fishing on this species.

Some other species may also have the biological potential for increased catches. Greatly increased numbers of larval sand-eels (Ammodytes spp.) have appeared in plankton surveys in the southern part of the region, possibly in response to some of the fishery-induced changes in other species. However, there is little sign of the development of any fishery on this species, while it is far from clear what the biological effects of such a fishery would be on the stocks of other species. With these exceptions, most stocks of fish, especially those of high commercial value, are fully exploited.

The total pelagic catch continued to decline, particularly for herring. Mackerel catches remained low, although this appears not necessarily a function of stock size, but catches of menhaden showed increases in the southern part of the region.

With respect to the very valuable scallop and lobster resources, a high degree of exploitation is evident in many areas. For the scallop resources, significant fluctuations in abundance appear to complicate the resource picture.

Management of shelf resources in the very productive sub-area 5 will hopefully be facilitated by recent international resolution of maritime boundaries crossing George's Bank, although here, as for other maritime boundary areas around the world, shared resources will need to be managed through some system for bilateral consultation.

In recent years interest has been shown by scientists in the region in the possible role of environmental factors and species interactions in causing fluctuations in catches under a relatively stable effort regime. Also market forces play a complex role in determining the species mix of the total landings, which appears to have shown considerable changes in the different sub-areas.

Tuna and billfish stocks in the region fall within the terms of reference of the International Commission for the Conservation of Atlantic Tunas (ICCAT) and are reviewed under the relevant section on Ocean Tunas and Billfishes.

NORTHEAST ATLANTIC (Area 27) (Table 4)

Most of the important fish stocks in Area 27 occur in more than one fishing zone and many of the stocks are exploited by agreements between governments or between governments and the European Economic Community. In the case of the North Atlantic salmon, management advice is given by the new North Atlantic Salmon Conservation Organization (NASCO) and in the Baltic the fish stocks (including salmon) are managed by following the advice of the International Baltic Sea Fisheries Commission (IBSFC). Another body, the Northeast Atlantic Fishery Commission (NEAFC) has nowadays mainly a general advisory function to its member states. All biological advice in Area 27, including research planning and recommendations on total allowable catches and other measures, is given by the International Council for the Exploration of the Sea (ICES), and especially through its Advisory Committee on Fishery Management (ACFM).

Total reported nominal catches in this area decreased somewhat in 1982 to about 10.8 million tons. Catches in the two preceding years averaged 11.7 million tons. In 1983 an increase of about 370 000 tons was recorded bringing the total catch to 11.1 million tons. As in previous years, the total removals from the fish stocks were higher than this due to unreported landings, discards at sea, etc. The order of magnitude of such officially unreported catches were substantial in some cases; figures taken from ACFM reports are given below for herring, haddock and plaice, for the year 1979 to 1983 ('000 tons).

	1979	1980	1981	1982	1983[a/]
Herring					
North Sea (Sub-area IV) and Channel area (Division VIId)					
Reported nominal catches	19	14	47	122	134
Total catches including non-allocated catches	25	61	141	236	308
Skagerak-Kattegat (Division IIIa)					
Reported nominal catches	66	64	114	112	208
Total catches including unallocated catches	74	84	171	147	198
Haddock					
W. Scotland and Division VIa					
Reported nominal catches	15	14	18	30	29
Total catches including discards	27	18	33	39	36
Plaice					
North Sea (Sub-area IV)					
Reported nominal catches	109	102	94	112	100
Total catches including unreported catches	145	140	140	154	144

a/ Preliminary data

For stock assessment purposes only those catch figures are used by ICES which are believed to be as close as possible to the true catches (including discards). It is obvious that any other practice would be detrimental to this work. Statistics for stock assessment purposes are compiled under the responsibility of those scientists in each country who also participate in ICES assessment work.

Catches of some fish species which in former years had formed a major part of Northeast Atlantic fisheries are still low. Examples are Atlanto-Scandian herring, North Sea herring and North Sea mackerel stocks. However, the North Sea herring stock has recently begun to recover, and the Atlanto-Scandian herring has only recently shown healthy signs of strong recruitment by the 1983 year-class, which is "about 30 times the average strength of the year-classes 1975-82 and is comparable to the strength of the strong year-classes before the collapse of the stock in the late sixties" (ACFM). It should be remembered that the collapse of this stock in the late 1960s was the largest loss of fishable biomass that had occurred in the Northeast Atlantic. The 1984 year-class also seems to be a strong one but a cautious approach is now required in opening the fisheries on the immature stock so that a considerable part of it can grow to maturity.

Following a period of closure, due to the very poor state of the stocks, the North Sea herring fishery was officially reopened in 1981, since then catches have increased ('000 tons):

	1979	1980	1981	1982	1983 a/
Total catches (scientists figures) 1/	25	61	141	236	308
Total allowable catch recommended by ACFM	0	0	20	60	98

a/ Preliminary data

The differences between the actual catches and the total allowable catches recommended by ACFM are considerable and show clearly the difficulties encountered in management. It should be noted that the herring fishery in the North Sea was formerly of great economic importance for many European countries.

The North Sea mackerel stocks has been at a very low level for a number of years and a zero TAC has been recommended for it. In addition, the fishery on the "Western" Stock (i.e., to the west of the British Isles, greatly exceeded the TACs recommended by ACFM ('000 tons):

	1982		1983	
	Catch a/	ACFM TAC	Catch a/	ACFM TAC
North Sea	47	0	47	0
Western Stock	648	270	625	330

a/ Scientists figures

Furthermore, in the statistics supplied to FAO for the whole area in 1983, including catches south of the North Sea and west of Scotland, mackerel catches amount to only 572 000 tons, i.e., about 50 000 tons less than ACFM figures. There is apparently a need for improvement of the reporting system.

1/ ICES terminology

There have been clear declines in some other fisheries in 1982 and 1983 in Area 27 as, for example, in the Icelandic capelin winter fishery, which in 1982 amounted to 13 000 tons and 0 tons in 1983 (but there has been a sharp increase in 1984). However, the Barents Sea capelin fishery did not show such abrupt changes. The industrial fishery in the North Sea showed a slight increase in 1982 and then a decrease in the following year. This fishery consists of a number of species, of which sand-eel, Norway pout and sprat are the most important. While at present no TAC predictions are possible for sand-eel, for Norway pout a preliminary estimate has been made. The stock of sprat is declining rapidly in the North Sea but again no acceptable assessments have been possible. All the three species mentioned are short-lived, which poses extra technical difficulties in the assessment work. The total production by the North Sea industrial fisheries has been as follows:

	1982	1983
Target species: sand-eel, Norway pout, sprat	1 122	1 049
By-catch: poutassou, herring protected species	319	282
Total	1 441	1 332

For poutassou (blue whiting) no reliable stock size estimates can be made as the biological data, including acoustic data, have given conflicting results. Catches in 1983 decreased to about half of the quantities taken in 1979 and 1980.

The Baltic Sea fishery is geographically enclosed and only the herring and cod stocks of the western Baltic show an exchange with the Kattegatt/Skagerak. Catches of autumn-spawning herring are still insignificant and catches of spring spawners in 1982 considerably exceeded the TAC recommended by ACFM. In 1985 ACFM recommended a reduction in catches to the F0.1 level in some areas of the Baltic, while in other areas it recommended precautionary TACs. After a catastrophic decrease in the size of the sprat stocks there are now signs of an increase. As present fishing mortality for cod is far in excess of F_{max} the present high exploitation rate has to be reduced.

As in other areas mentioned above, there are substantial differences between the catch figures collected for assessment purposes (ACFM) and the statistics for the Baltic fisheries officially reported to FAO.

Advice has been given to the North Atlantic Salmon Conservation Organization by ICES for the first time. Regarding hake and sardine fisheries in the southern part of Area 27 there has been, during recent years, a decrease in the quality of catch statistics and in the amount of biological data available. Therefore no assessments of these stocks have been possible.

Thus most stocks in Area 27 are heavily fished and when TACs are recommended by ACFM they are nearly always substantially exceeded by the fishery. Of course, this greatly influences the assessment work and new approaches have to be found for management. The fishery itself contributes partly to these difficulties when, for example, a so-called sprat fishery in the North Sea contains 50 percent (by weight) by-catch of herring and this catch is not included in the TAC for herring. The fact that sprat and young herring of the same size class often occur together in catches needs to be taken into account. Other deficiencies are the poor effort and catch-per-unit-effort data provided by the fishing nations and the questionable validity of using only single species models. A Working Group within ICES is now studying new approaches to utilize the predator/prey relationship in some multi-species assessments.

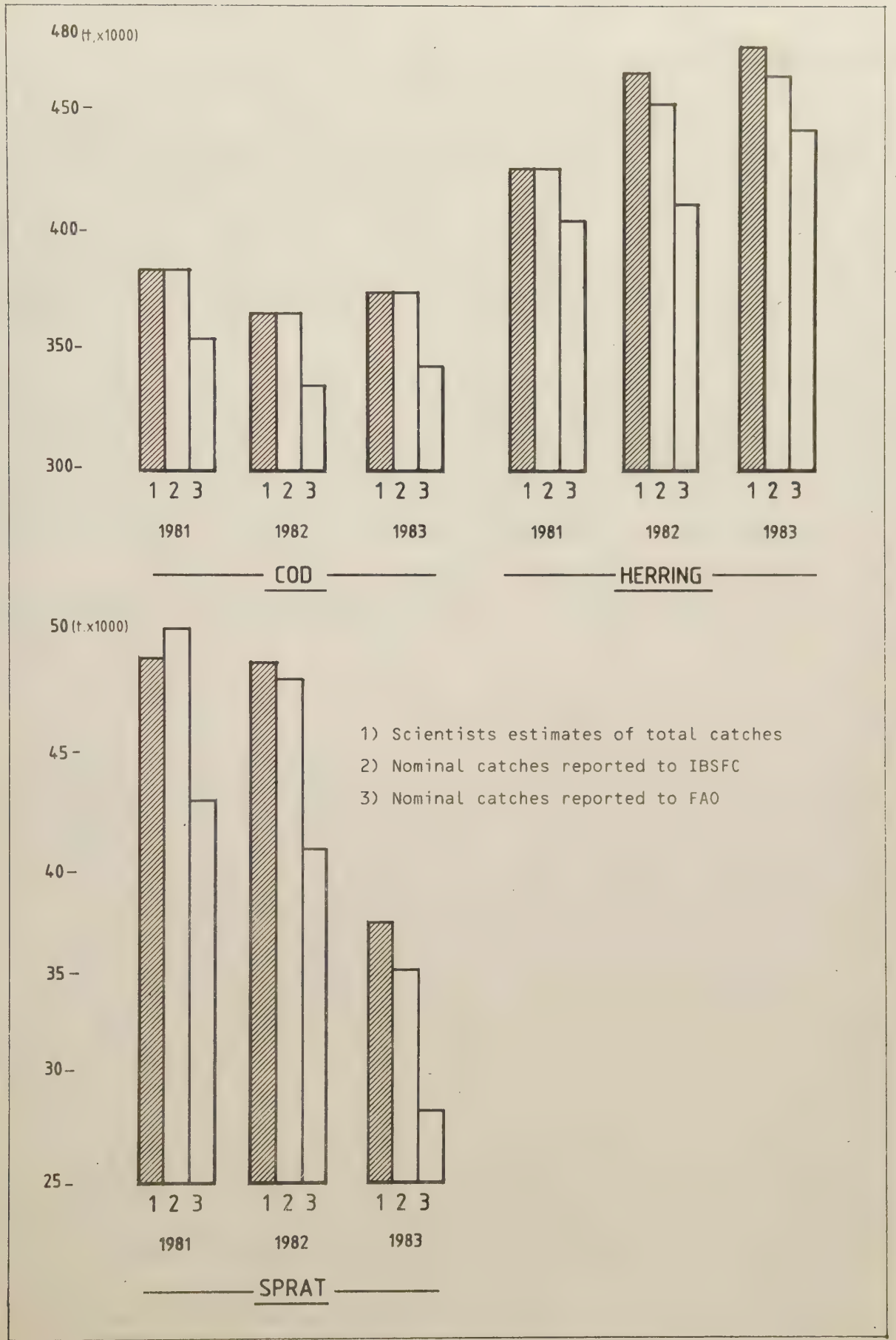


Fig. 2 Catch data for cod, herring and sprat as supplied by ACFM of ICES, IBSFC and FAO

WESTERN CENTRAL ATLANTIC (Area 31) (Table 5)

Reported landings from the commercial fisheries in the region rose to the record level of nearly 2.3 million tons in 1983. This figure must be qualified because it does not include the catch by sports fishermen, or the quantities discarded at sea by commercial shrimp trawlers. Along the US Gulf and South Atlantic coasts the catches of the preferred species by sports fishermen generally exceed the commercial catches. Discards by shrimp trawlers continue to be significant, though very variable for different shrimp fisheries in the area. Subtraction of these from the potential for increases in groundfish production suggested in Table 5, reduces the potential for further expansion of bottomfish catches, though this remains significant. Groundfish on the outer shelf and slope remain relatively untouched.

Although significant increases were recorded by a few countries (especially Mexico), catches of most other countries (including the USA, which takes about two-thirds of the total) remained relatively constant in the last two or three years. Cuban catches have declined slightly from a peak around 1976. This, however, has largely been a result of lower emphasis in recent years on the distant water fleet. Domestically, improved management through a system of local "fisheries bureaux" appears to have stabilized or increased landings of several valuable coastal resources.

Catches of Gulf menhaden, having reached 820 000 tons in 1978, declined in the next three years, but increased again to 924 000 tons in 1983. This variation seems typical of this type of pelagic fish. Catches of small pelagic fish have reached significant levels in the Southwest Caribbean (Venezuela), and although the presence of a significant biomass of these resources has been identified in the Guianas-Brazil region, exploitation to date has been limited.

The scattered nature of most of the fisheries (other than menhaden and shrimp) and the deficiencies in much of the basic data on statistics, etc., continue to make accurate assessments difficult. Progress is being made, especially through regional collaboration, e.g., by the Western Central Atlantic Fisheries Working Party on Assessment of Marine Resources, where comparison between areas (e.g., coral reefs) in different countries with similar ecological characteristics are giving promising results. These indicate, for example, that the yield from shelf areas around the Caribbean islands is around 0.5-1.5 t/km^2/year. This is rather less than some earlier estimates, which tended not to take account of the proportion of relatively unproductive sandy bottom. These results are tending to confirm earlier impressions that much of the demersal resources are already fully exploited, and that the greatest potential for expansion will come from the smaller pelagic fish, as well as from squid and other less familiar types of fish. Since many of these species move over considerable distances (greater, for example, than the distances between the adjacent islands in the Lesser Antilles chain), their utilization and rational management should involve close collaboration between these countries.

Great interest has been expressed in recent years in the question of stock identity of key resources (e.g., spiny lobster, conch and dolphin fish), and new techniques to identify stocks (e.g., protein electrophoresis) are being employed, and indications are that more than one stock of pelagic fish (dolphin, flying fish and king mackerel) exists in Area 31.

The marine resources of the area fall within the terms of reference of the Western Central Atlantic Fisheries Commission (WECAFC). The Commission and its two working parties (on marine resources and statistics) meet in alternate years, as does its Committee for the Development and Management of Fisheries in the Lesser Antilles. To date this body is a consultative

forum and has played no direct part in setting regulations or managing resources, which function is generally carried out nationally (or bilaterally in some cases).

Tuna and billfish stocks in the region are reviewed in the relevant Chapter of this review and fall within the terms of reference of the International Commission for the Conservation of Atlantic Tunas (ICCAT).

EASTERN CENTRAL ATLANTIC (Area 34) (Table 6)

The assessment and elaboration of biological advice for management of the resources of this region at regional level is undertaken by the Committee for the Eastern Central Atlantic Fisheries (CECAF). The reported catches from this region have again increased after decreases in 1978 (-12% from 1977) and 1979 (-24% from 1977). They reached nearly 3.5 million tons in 1980, following a renewal of the normal activities of the long-range fleets off Northwest Africa and levelled off at about 3.2 million tons since 1981. With a few exceptions, for example, Morocco, the catches by the coastal countries increased little. Some of the foreign fleets have adapted quickly to the new conditions created by the new regime of the oceans, and are now often paying licence fees.

The FAO/UNDP Regional project on the Development of Fisheries in the Eastern Central Atlantic has continued to promote, as in the past, evaluations of the state of the stocks. On the whole there have been no notable changes and, in general, most of the stocks are heavily fished or overfished.

Northern Sector

In the northern sector of CECAF, to the north of Cape Timiris, the demersal stocks are almost fully exploited or overexploited. These include cephalopods, hakes, sparids, etc., the one possible exception being the stock of black (Senegalese) hake found to the south of Cape Juby. The catch rate of cephalopods is now only 10% of that obtained at the beginning of the exploitation and the fishery is in a critical economic situation. The stocks of white (Moroccan) hake are overexploited with too high a fishing effort and too small a mesh. Recent analyses have demonstrated the excessively high level of mortality applied by Moroccan trawlers to small hake, but have also shown that a correction of this biologically suboptimal fishing strategy would primarily benefit foreign fleets fishing for older hakes, as well as shrimps on the continental slope. The state of the stock of shrimps exploited together with the hakes has not yet been assessed. The coastal stocks of sparids are heavily exploited to the north of Cape Juby and markedly overexploited to the south of Cape Bojador, where the important recovery of the stock is threatened by the rapid expansion of the cephalopod fishery which is incidentally producing a high fishing mortality on juvenile sparids.

The stocks of sardines found to the north of Cape Bojador undergo considerable year-to-year fluctuations in abundance in relation to environmental conditions. In 1982 the catch was over 180 000 tons, obtained by a level of exploitation that was not excessive ($F/z < 0.5$)[1/]. Because of good recruitment in 1978, 1980 and probably 1982 the biomass is now back to the high levels observed before 1973. However, long-term trends in the upwelling strength have seriously reduced the accessibility of the stock to the traditional Moroccan fishery. The sardine stock to the south of Cape Bojador has declined since 1974. This stock increased after 1970 and replaced the sardinellas, which moved further south and there is no long-term assurance of the permanent existence of this sardine stock. A reverse movement might soon occur.

1/ F = Fishing mortality coefficient: Z = Total mortality coefficient

The present stock of horse mackerels of the northern sector of the CECAF area is estimated to have a potential of about 400 000 tons and seems to be fully fished at present. Recruitment shows a decreasing trend since 1979. The stock of mackerel is estimated to be about 100 000 tons and is thought to be fished beyond the level of the MSY. Wide year-to-year fluctuations in abundance (or availability) are observed for these two resources, implying that these conclusions must be considered with caution. The variations in apparent abundance of sardines are inversely correlated with the variations of mackerel and horse mackerel. The trumpet fish (Macroramphosus spp.) seems to be an unstable resource. Its potential production was estimated as being 400 000 tons in 1979, but these resources seem now almost to have disappeared without any fishery having developed.

In the Mauritania-Senegal sector the fishery has undergone major developments in the last 10 years, due to increases in fishing by foreign fleets (Mauritania) or the development of national fishing capacity (Senegal). Catches have not increased very much and the stocks traditionally exploited are considered at least fully fished. The levels of abundance of demersal stocks off Mauritania seem to be very low. The Sardinella aurita stocks are subject to year-to-year fluctuations in abundance (and potential) in relation to the environmental conditions. The overall situation of this resource in the sector is a matter for concern. The share of the total catch obtained by the artisanal fishery of Senegal has increased (+23% between 1981 and 1984), but yields have fallen drastically (to about 30% of the 1972 level) due to a recent very sharp decrease of the abundance of the round sardinellas. The stock is considered lightly underfished globally, but overfished locally.

Southern Sector

In the Sherbro area (Sierra Leone and Liberia) the state of the stocks is not well known. It has been heavily fished by foreign fleets in recent years, but biological data and statistics are still inadequate for a rigorous scientific analysis.

In the Gulf of Guinea, from the south of Sierra Leone to the Congo estuary, the continental shelf is narrow and the density of stocks lower than in the north. The estimate of the potential demersal catches is thus low - between 240 000 tons and 300 000 tons. The estimate includes the potential of small, but relatively abundant species, e.g., Brachydeuterus auritus which is not generally caught, or at least not marketed, in the northern part of this sector. Throughout the sector, the most commonly captured fish species close to the coast, in depths less than 50 m, seem to be fished at about the level of maximum exploitation. The demersal stocks further offshore from 50 m to 200 m are still some way from full exploitation. However, it is unlikely that their exploitation will increase because the fishery is not economically attractive due to the low density of fish and the poor catch rates.

With total catches of the order of 15 000 tons, the pink shrimp (Penaeus notiatilis) present in small concentrations from Senegal to the Congo seems to be at the level of maximum exploitation. Competition exists between artisanal inshore and industrial offshore fisheries.

The effect of changes in the mesh size used in trawling for fish, shrimp and cephalopods in the Gulf of Guinea, has been examined. These studies show that it would be useful at the first stage to adopt a 60-mm mesh (stretched mesh) for all trawling operations. This mesh size was recommended by CECAF in 1979, but is not yet strictly enforced.

The present state of pelagic resources in the sector is poorly known with the lack of adequate research in the Sherbro sector from Guinea Bissau to Liberia and from Gabon to Angola. The sardinella stock of Togo, Ghana and Ivory Coast has undergone large variations in abundance and was nearly extinct between 1972 and 1975. The stock has now recovered to a reasonable level. The great reduction in the stock of bonga in the Aby Lagoon in the Ivory Coast, due to overexploitation following development, should be noted.

Two important stocks of the triggerfish (Balistes capriscus) have developed since the early 1970s in the Ivory Coast-Benin sector and in the Guinea Bissau-Sierra Leone sector. The biomass in the whole Eastern Central Atlantic, which originally was negligible, has now reached about 1 500 000 tons.

MEDITERRANEAN AND BLACK SEA (Area 37) (Table 7)

The advices and measures for the management of the resources of this area are elaborated through the General Fisheries Council for the Mediterranean (GFCM) and the Joint Commission on the Fisheries of the Black Sea.

The total reported catches (1 872 000 tons in 1982) have increased by 685 000 tons (58%) since 1975 due to the increase in reported catches of the minor species such as gadiformes, clupeoids and rays, sharks and chimeras. The main cause of the increase in catches was the growth in anchovy catches which, from an already significant tonnage, increased by 75%.

The countries reporting a significant growth since 1975 are Bulgaria, Egypt (+29%), Morocco (+60%) and particularly Turkey (+325%), which was responsible for a large part of the total growth in landings. One may suspect that this large rise results as much from improvement of statistics as a growth in actual catch.

Since 1980 the evaluations of the resources have been updated as regularly as possible within the framework of GFCM in a series of technical consultations held every year in the Western and Central Mediterranean area, as well as in the Adriatic Sea area. Changes in the fisheries and in the resources are very slow and these evaluations have confirmed and made more precise the knowledge already available.

In the Western Mediterranean all the stocks are very heavily exploited except possibly the mackerel and horse mackerel and one cannot expect any increase in catches, at least in the traditional areas. Long-term fluctuations in abundance (not due directly to exploitation) should be noted for the stocks around the Balearic Islands (for hake and red mullet). Species composition changes have been observed in the catches of recent years with a gradual shift from a sardine to anchovy dominated catch in Spain, Morocco and Algeria.

In the Adriatic the quality of fishery statistics does not allow a detailed analysis. The stocks of small pelagic fish seem to have been increasing since 1976, perhaps linked with the eutrophication of the Northern Adriatic. The demersal stocks are probably fully exploited or overexploited, as indicated by the small size of fish in the landings and the results of the most recent trawl surveys.

In the Central Mediterranean the demersal resources generally, but with some geographical differences, are fully exploited. Off Italy the stocks are very heavily fished, and the density of fish is about one-fifth of those in Tunisian waters. The small size of fish caught in Italian waters, both in the Adriatic and in the Central Mediterranean, clearly

shows growth overfishing (loss of potential yield through catching fish when they are too young). The small pelagic fish, both those along the coast (sardines), and those offshore (horse mackerel) are still lightly exploited.

Throughout the Mediterranean the small-scale coastal fisheries are generally neglected, though they have considerable social and economic importance. The catches are often poorly recorded, and therefore the reported catches for the Mediterranean are seriously underestimated.

The majority of countries have adopted the regulations for a 40-mm mesh, as proposed by GFCM, but many of them have indicated that in practice much smaller meshes are used. Controls on the total fishing effort have also been recommended by GFCM, and methods of applying such controls are under study. Several countries (Spain, France, Italy, Yugoslavia, Greece and Tunisia) are moving in this direction. A recent enforcement of a closed fishing season during the recruitment period of the red mullet in Cyprus has led to an increase of nearly 100% in the total national production in 18 months, underlining the high degree of growth (and perhaps recruitment) overfishing that had existed.

In summary, in the Mediterranean proper, the pelagic stocks offer the best possibilities for greater production through rational exploitation, but the progress made is still disappointing. In several areas the horse mackerel in deeper waters could produce more if fished harder. However, there are signs of overexploitation in sardine stocks in the Western Mediterranean. Because of the evidence of long-term changes in species abundance, these conclusions must be taken with caution. Elsewhere this species is fully exploited. In the Black Sea, there is concern over the stocks of anchovy and horse mackerel. If indeed the exploitation of these species has been intensified in the past few years, there has not been parallel progress to be observed in the collection of data, and in the monitoring of the resources.

SOUTHWEST ATLANTIC (Area 41) (Table 8)

After a decrease to 1.3 million tons in 1980 and 1981, total catches increased to 1.5 million tons in 1982 and to 1.7 million tons in 1983. Most of this increase comes from increased catches of southern blue whiting and squids in the Patagonian Shelf area.

The biggest fishery in this area is still that of hake, Merluccius hubbsi, exploited almost entirely by Argentinian and Uruguayan fleets. Catches of hake in 1982 and 1983 remained at more or less the same levels as in 1980-81, which is still lower than the 417 000 and 460 000 tons caught in 1978 and 1979. This stock seems to be moderately exploited.

No major changes have been observed in the catches of croakers and weakfishes. There are several local stocks of these species throughout the area, and most are moderately or fully exploited, with some limited possibilities for future expansion of some local fisheries, particularly in northern Brazil. The stock of weakfish off the River Plate Basin was heavily exploited, but there are some indications that following some management measures introduced in 1983 the stock might be recovering.

After the low catches of squids in 1980 and 1981, catches of these species have increased in 1982 and 1983 when annual catches were 200 000 tons per year. Between 160 000 and 170 000 tons are flying squids (Loliginidae) caught mostly along the border of the southern Patagonian shelf by Polish, Japanese and Soviet fleets. Also 30 000 to 40 000 tons of short fin squid (Illex) are caught by Argentina within its exclusive economic zones.

Catches of Sardinella were maintained at the same high level. Brazil reported a total catch of 197 000 tons of this species in 1982 and 240 000 tons in 1983. This stock seems to be fully exploited. Other stocks of clupeoids and other small pelagic stocks in the area seem to be lightly exploited or virtually unexploited. The stock of anchoveta off the River Plate Basin is also virtually unexploited. Some attempts are now being made to increase catches of these species, particularly for use for fishmeal, but catch is still very low. The estimated potential is of the order of 1 million tons, and catch in 1982 was 10 000 tons and 28 000 tons in 1983.

One major change has occurred in the stocks of red shrimp (Pleoticus muelleri) off Argentina. Catches have been increasing steadily from 2 600 tons in 1981, to 7 700 tons in 1982 and to 19 000 tons in 1983. Preliminary information indicates that catches in 1984 were increasing at more or less the same rate. This change in catches seems to be associated with both an increase in the overall abundance of the stock and the increased interest in the fishery by other fleets that traditionally were fishing for hake or other demersal species in other areas off the Argentinian coast. No estimate of the long-term potential of this stock is available, and there are some indications that both the distribution area and the overall abundance of this stock has been increasing over the past few years. The question is how long this period of high abundance will last? In the meantime, investment and fishing for red shrimp continues to increase, and it is certain that there is a need to manage the development of this fishery if adequate utilization and sustained yields of this stock are to be attained.

A major change has also been noticed in the catches of southern blue whiting (Micromesistius australis). Fishing for this species has been increasing steadily over the past few years, increasing to 140 000 tons in 1982 and to 260 000 tons in 1983, with probably the same increasing trend for 1984. Most of the catches are made by Polish fleets, and to a lesser extent by Soviet fleets on the southern part of the Patagonian Shelf and slope. Several biomass estimates had been made in the past, and these indicate that the potential yield is of the order of 100 000 tons and with the current level of exploitation, there is serious concern that this stock, which until a few years ago was virtually unexploited or very lightly exploited, may become an overexploited one. Grenadier (Macroronus spp.) in the Patagonian Shelf and slope also increased from below 1 000 tons in 1981-82 to 18 000 tons in 1983.

The Patagonian Shelf area provides a good example of shared stocks occurring in both the exclusive economic zones and the areas beyond and adjacent to it, and it is clear that with the current developments and the increase in fishing effort in the area there is a growing need for international cooperation to manage these fisheries and to ensure conservation of these resources both within and beyond the waters under national jurisdiction.

There is no regional or international organization responsible for the management or the research of shared stocks occurring in both the exclusive economic zones and beyond and adjacent to it in the Patagonian Shelf area. FAO convened a working party in February 1983 (see FAO Fish. Rep. No.297) to analyse the scientific information available on part of the area (north of 48°S) and no signs were observed at that time of fish stocks being seriously affected. This Working Party recommended that "all parties

involved endeavour to set up mechanisms that will allow available scientific information, fishery statistics and other relevant data to be contributed and exchanged on a regular basis, and to set up a scientific framework to facilitate future agreements regarding the management of fishery resources in the area". So far no successful attempts have been made to set up such mechanisms to promote international cooperation in the area. However, if no management measures are introduced further development of fishing in this area may result in undesirable depletion of some fish stocks.

In the River Plate Basin, Argentina and Uruguay have established a common fishing zone and a Joint Technical Committee, operational since 1974, which is responsible for coordinating research and facilitating the adoption of bilateral agreements for the exploitation and management of fisheries in the common zone.

In Brazil there are around ten inter-state permanent working groups responsible for providing advice on the management of an equal number of fisheries along the Brazilian coast. Depending on the circumstances these permanent working groups meet once a year or every two years to update the information and data and assess the situation of the given stocks or group of stocks for which they are responsible.

SOUTHEAST ATLANTIC (Area 47) (Table 9)

The exploitation of the stocks of this region is monitored through the International Commission for the Southeast Atlantic Fisheries (ICSEAF).

In this region there is a great contrast between the state of the stocks of the two groups of pelagic fish - the clupeoids (pilchard and anchovy, exploited mainly by the local purse seine fleets) and the horse mackerel (exploited mainly by the large distant-water trawlers). Although the growth of the horse mackerel stocks, whose biomass increased three-fold between 1970 and 1980 has slowed down or stopped, the abundance is still high. On the other hand, the pilchard stocks off Namibia and off South Africa are both at a very low level, and show no sign of recovery. The anchovy resource, in which there may be an interchange of fish between South Africa and Namibia, is in a reasonably healthy state, but shows no sign of expanding to balance the decline in pilchard. Catches of anchovy (and also of sardinella in the northern part of the region) declined slightly in 1980 and 1981. Together with a decline in hake catches, the result was that the total catches dropped from about 3.3 million tons in 1978 to 2.2 million tons in 1980 and stabilized at 3.3 million to 3.4 million tons since 1981. These figures are lower than any other year since 1965.

Unlike most other regions of the world, where the burden of changes has fallen mainly on non-local fleets, in the Southeast Atlantic the recent drop in catch has been felt equally by non-local and local fleets. The latter still take only about 40% of the total catch. Pending independence of Namibia, there is no coastal state control over fishing off Namibia beyond territorial waters. Angola is putting emphasis on small-scale inshore fishing. Industrial-scale fishing off Angola is dominated by long-range fleets, and Angolan catches are still only a fraction of those occurring before independence.

The principal management measure in all the fisheries has been annual catch quotas. For the South African multispecies purse seine fishery a global quota of 380 000 tons has been set for each of the past seasons up

to and including 1983, but there is concern that this is not giving adequate protection for the depleted pilchard stock, and may be higher than is altogether safe for the anchovy. Record catches of round herring (Etrumeus sp.) occurred in 1983. Similar concern have been expressed in respect of the Namibian pelagic fishery. Although the quota for pilchard has been severely reduced, it appears that this reduction has not been as fast as the decline in the stock, and fishing mortality is still very high. The overall biomass decreased for pilchard and increased slightly for anchovy up to the 1982 level. For 1984, it has been suggested that anchovy catches should be limited to 200 000 tons.

Quota management for hake, in which the global quota (429 000 tons in 1984) is divided into national allocations seems to have been more successful. The reported figures indicate that there was a drop in effort since 1980 and that the decreasing trend in stock abundance has been halted or even reversed off both South Africa and Namibia. Total quotas have been set by ICSEAF for chub mackerel and horse mackerel off Namibia (200 000 tons and 630 000 tons in 1984, respectively). These quotas are not allocated, and the limitation of the total catch to these figures depends on a somewhat complicated reporting system. The existence of the quota may therefore prevent the catches grossly exceeding the target value, but may be less effective in providing close control. No real control of fishing pressure is yet exercised for the other species, although fishing for snoek is now under close monitoring. In this region as in many others, the regulations are often not being fully complied and enforced. However, the most recent informations indicate that the rate of infractions has significantly decreased.

WESTERN INDIAN OCEAN (Area 51) (Table 10)

Improvements in the reporting on landings by species in recent years in this area have made it possible to present landings by species groups rather than by very large categories. The amount of unidentified and/or poorly identified fish was still some 25% of the total in 1983. The bulk of the landings consists of the catches of shrimp trawlers, comprising shrimp and small demersal species, particularly in India and Pakistan. Trawl fishing for cuttlefish, deep sea lobsters and valuable large demersals is mainly done by non-local vessels under joint venture agreements. Fisheries off the East African coast, the island states and in a large part of the Red Sea are mainly limited to the coastal waters and in particular to the coral reefs and beaches. Large-scale fisheries for pelagic species are limited to Southwest India (purse seine for sardinella), the Maldives and Sri Lanka (pole and line for tunas) and to foreign tuna fleets (longline and purse seine since 1983). Of the 178 000 tons of tunas and tuna-like fish landed in 1983, about 100 000 tons or 57% was caught by local fishing vessels (Table 10). The large pelagic resources off North Somalia remain untapped except for the catches by a few Romanian vessels, which include the round herring (Etrumeus sp.).

The Table given below gives an indication of the exploitation rate based on the landings of 1981 and the lowest limits of research vessel data for the Arabian Sea, the Gulfs and the Red Sea.

Landings expressed in '000 tons in 1981 compared with regional sustainable potential of pelagic and demersal fish in the Arabian Sea, the Gulfs and the Red Sea

	Landings 1981					Potential[a] fish		Exploit. rate (%)	
	Cephal. + misc.	Crusta-ceans	Tuna	Fish Dem.	Pel.	Dem.	Pel.	Dem.	Pel.
Somalia	-	0.8	-	5.0	5.0	81	378	6	1
PDRY[b]	9.6	-	-	21.1	8.5	44	171	48	5
Oman	-	-	-	8.5	61.5	32	299	27	21
Gulf States	-	14.2	-	46.5	81.7	160	336	29	24
Pakistan	2.8	30.0	9.5	132.5	86.7	185[e]	280[e]	72	31
NW India[c]	17.5	108.5	1.4	313.3	66.3	440[f]	200?	71	33?
SW India[d]	23.3	43.9	10.4	73.4	314.5	180[f]	800[g]	41	39
Maldives	-	-	29.3	2.5	3.0	25?	30?	10?	10?
Red Sea	?	?	?	19.5	57.0[i]	80[h]	80[h]	24	71[i]
Total	53.2	197.4	50.6	622.3	684.2	1227	2574	51	27

a/ Lower estimates based on 'DR FRIDTJOF NANSEN' data for Somalia, PDRY and Oman
b/ Includes Socotra
c/ States Gujarat and Maharashtra (Central Marine Fisheries Research Institute, 1982)
d/ States Goa, Karnataka, Kerala and Lakshadweep (Central Marine Fisheries Research Institute, 1982)
e/ Given by Chikuni (Appleyard et al., 1981)
f/ 180 000 for Southwest India as given by Shomura, Northwest India 50% of Shomura's estimate
g/ Subject to large fluctuations
h/ Sanders and Kedidi, 1981
i/ Probably too high due to lack of recent data from Ethiopia

The potential for cephalopods is probably much higher than the present landings. Crustaceans are generally fished at or over the level of maximum sustainable yield with the exception of a few small areas or resources, e.g., Yemen Arab Republic, Gulf of Masirah and deep-sea lobster (Puerulus sp.) off India.

The landings of fish have been divided into the categories of demersal and pelagic. The exploitation rate in the last columns is the percentage of the given potential that was being landed in 1981. Even when using conservative figures for potential it is obvious that the resources are far from being fully utilized, but it will be necessary to consider the economic feasibility of the possible intensification of the fishing pressure.

The highest exploitation rates are those for demersal fish in India, but the figures for potential are more guesses than properly calculated quantities. The pelagic resources are very much underutilized, in particular off Somalia. The figures for the pelagic resources of the Red Sea are unreliable because of the uncertainty about the Ethiopian fisheries and the exploitation rate may actually be much lower than 71%.

A significant increase in recruitment of shrimp (Penaeus semisulcatus) was noted in Kuwait and other countries in 1982 and 1983 compared with 1981.

Recent work on the Red Sea stocks has indicated localized full or over-exploitation. These include the small pelagics (Trachurus indicus, Etrumeus teres) exploited by purse seine, and the small demersals (Saurida undosquamis, penaeid shrimp species) taken by trawl, both in respect of the Gulf of Suez (licence limitation is being applied in these fisheries). Reef associated species (Serranidae, Lutjanidae, Lethrinidae) are also considered fully exploited in the northern Red Sea. Substantial potential exists, however, to increase catches in more southern parts, in the underutilized penaeid shrimp receiving increased attention off Saudi Arabia (south), the Yemen Arab Republic, and Sudan (south) because of their relatively high value.

In the People's Democratic Republic of Yemen, cuttlefish (Sepia pharaonis), deep-sea lobster (Puerulus sewelli) and rock lobster (Panulirus homarus) have been established as fully exploited along the northern shelf areas; with effort control being applied and cod-end mesh size control being considered in respect to the trawl fishery for cuttlefish. A recent assessment based on catch and effort data for the sardine (Sardinella longiceps) suggests the stock is substantially less than estimated by acoustic methods.

Survey results off Kenya and Tanzania indicated no or little room for expansion. In Mozambique and probably also off northern Madagascar, considerable pelagic stocks remain to be exploited. In the island states the general pattern is that stocks close to the major centres are fully or over-exploited, while a potential still exists on distant banks.

Beyond the continental shelf, which is particularly narrow off the African coast, only tunas and billfish resources can be harvested. These stocks are discussed in a separate section.

The mesopelagic stocks in the Gulfs of Oman and Aden were assessed again acoustically, and a reduction in the stocks was noticed, although harvesting of this resource does not take place.

EASTERN INDIAN OCEAN (Area 57) (Table 11)

Bangladesh and Burma, forming the northern and eastern shores of the Bay of Bengal, only report total landings and even these figures are not based on sound statistics. Other countries also report large quantities of miscellaneous fish, consequently only 50% of the total landings from this area are reported by species categories.

The landings have increased by over 300 000 tons since 1980 to reach 1.77 million tons in 1983. The largest contribution to this increase was 125 000 tons of jellyfishes landed in Thailand (see Table 11).

Significant increases can also be noted for species forming the by-catch of shrimp fisheries (e.g., ponyfish and croakers), as well as most small pelagics, such as sardines, mackerels (Rastrelliger spp.) and carangids, tuna-like fishes and lobsters (Australia). Considerable fluctuations were observed in the landings of several species or species groups over the period 1980-83.

The overall landings of shrimp remained stable at 15 000 tons, but there was a sharp drop in Indonesia in 1981, followed by a steep increase, probably caused by the ban on trawling and the subsequent development of other fishing methods. The landings of shrimp in Thailand showed a similar pattern, perhaps due to the termination of fishing outside Thai waters (Bangladesh).

In Bangladesh it is estimated that about 3 000 tons of shrimp are caught by trawlers while the rest is produced in coastal ponds from natural stocks. The by-catch of the trawlers is not often utilized. The rapid expansion of the trawler fleet causes concern.

In India the rapid development of a fleet of small trawlers based in major harbours has caused such a decline in catch rates of shrimp that their operation has often become uneconomical. Also the development and rapid introduction of highly efficient high opening trawl gear may cause conflicts with smaller scale fisheries.

Two tiger prawn stocks off Western Australia have shown severely reduced recruitment which has been related to excessive fishing effort. One stock is recovering through area closure, but for the other stock this method could not be applied due to other fisheries.

The lobster, abalone and scallop fisheries of Australia are very important and are well managed.

The assessment and management of fish resources, however, are generally at a low level throughout the region. Acoustic and trawl surveys off Indonesia by R/Vs DR FRIDTJOF NANSEN and JURONG did not detect any substantial new resource. The results of the Australian section of the JETINDOFISH survey have not been published, but surveys off southern Australia identified substantial pelagic resources including jack mackerel and gemfish.

A systematic survey of the demersal resources of Burma was completed in 1983. Potential yields were highest in the waters less than 50 m deep, which are already heavily exploited by artisanal fisheries.

Further surveys were initiated off Bangladesh and in the deeper waters off India. A full review of the resources of the Bay of Bengal project area is in preparation. Data collection and training programmes for the assessments of Hilsa, Rastrelliger and other stocks are under way.

Small-scale tuna fisheries, mainly for skipjack and little tuna are still developing in the area, in particular in Indonesia. In India on the other hand catches of this category dropped to 50% of the 1980 level.

Demersal fish off Western Australia is to a large extent exploited by foreign pair trawlers. Pelagic resources off South Australia, including jack mackerel, pilchards, snoek and gemfish are underutilized. Prospects for trawl fisheries in this area are not very good, but harvesting of substantial squid resources has recommenced recently in cooperation with other countries.

NORTHWEST PACIFIC (Area 61) (Table 12)

The marine catch from this area has continued to increase at a rate of 3.5-4.5 percent every year for the past decade and reached about 21 million tons in 1983. This is the highest ever catch for the area, which retains its top position among the areas with some 31% of the total world marine catch. The production is also distinct, being supported by the environmental diversity in the area with its well-balanced composition between demersal and pelagic species which resembles that of the second highest productive area, the Northeast Atlantic (Area 27), where the annual catch is around 11 million tons per year.

While most countries in the area showed a steady increase in catches, those by Hong Kong, Macau and Taiwan, Province of China, showed little change. No fisheries statistics are available from the DPR of Korea and only incomplete statistics from China and therefore the state of the resources and the fisheries on them cannot be fully assessed in the western and southern regions of the area.

In the northern region many salmon stocks which have been depleted by overfishing and deterioration in their spawning/nursery rivers, are now showing clear signs of recovery. There has been a remarkable increase in the net return of USSR origin pink salmon (both odd- and even-year classes) and Japanese origin chum salmon. The latter is encouraging as it resulted chiefly from the success of the re-stocking programme. A substantial increase in the total salmon catch is therefore expected in the near future.

Almost all the commercially useful demersal fish stocks in the area are being exploited, and nearly all are being fully exploited or over-fished.

The continuous high production of Alaska pollack in the northern region, with an annual catch of 3 million to 3.5 million tons, is a highlight among demersal stocks in the area, and is the highest yield from any one demersal species in the world. The current catch seems to have reached its maximum level and no greater catch is therefore expected. On the other hand, in the southern region, in the Yellow Sea and East China Sea, there is serious overfishing of many demersal stocks. The present abundance of the demersal stocks of commercial value in this region is estimated to be one-fifth to one-tenth of their previous highest levels and there has not yet been any positive sign of recovery. Various demersal stocks in the central region, around Japan, have generally been stable throughout the years.

Coastal pelagic fish stocks in the area have shown three marked features, firstly their very high level of productivity with an annual catch of 3 million to 6 million tons, secondly the large fluctuations in abundance of many species, and thirdly, as a result, dramatic changes in dominancy from one species to another. These features have been most marked in the stocks around Japan, involving the Pacific herring, Pacific saury, Japanese sardine, Japanese chub mackerel, Japanese anchovy and Japanese jack mackerel. One example of this, and a highlight among pelagic fish stocks, has been the dramatic change in stock abundance of Japanese sardine. The catch, which had fallen to only about 9 000 tons around the mid-1960s, now exceeds 4.2 million tons which is the world's largest single species catch. Similar changes have occurred in the other pelagic species in the past, though the magnitude varied.

Clear causes for these changes have not yet been found; however, it has been generally accepted that the major causes are probably natural and there is little evidence of a direct link with fishing. In recent years the abundance of Pacific saury and Japanese anchovy have declined and remained at a lower level, while Japanese jack mackerel and Pacific herring have seriously declined, and Japanese chub mackerel appears to be in a descending phase, probably related to the recent burst of Japanese sardine.

The total catch of all pelagic fish in the area in recent years has been 5 million to 6 million tons, however. It is rather doubtful whether this level will be maintained as it is probable that the present level is near the maximum of a long-term fluctuation. Due to these great changes in relative abundance of the different species, it is not possible to establish long-term sustainable yields for the individual species.

Cephalopods may be the only resources in the area which still retain ample room for increased fishing, though Japanese flying squid and other cephalopod stocks around Japan are heavily fished. The oceanic squids in the northern region together with coastal cephalopods in the southern region could provide substantially larger catches.

Prawns and shrimp stocks in the area have been generally fully exploited and some are overfished. A greater catch is therefore not expected.

The potential yields of the major species groups have been estimated to be ('000 tons): salmon: 300-350; demersal fish: 6 500-7 000; coastal pelagic fish: 5 800-6 500; tunas and billfishes: 280-380; cephalopods: 950-1 250; prawns and shrimps: 400-600; other fish (current level): 3 800-3 900; others (current level): 1 750-1 850, totalling 19 800-21 830. This implies that the production of more than 90 percent of the estimated potential yield has already been achieved in the area in recent years, even if the recent huge catch of coastal pelagic fish is regarded as an exceptionally large production at a transitional stage.

After the extension of national jurisdiction on fishing to 200 miles offshore by four of the nations in the area: Japan, Korea DPR, USA and USSR, managerial responsibility for many major stocks in the northern part of the area has fallen on one or another of these coastal countries. There have been a few bilateral arrangements for fishing by non-coastal fisheries in these waters; Japan-USSR and USSR-Japan Fisheries Conventions define the management measures for non-coastal fisheries in the counter-partner's jurisdictional waters; Japan-USA and Korea Rep.-USA agreements define the fishing by Japan and Korea Rep. in US waters. The Japan-USSR Fisheries Cooperation Convention deals mostly with the Japanese salmon fishery on the high seas for the fishing on USSR-origin salmon.

China and the Republic of Korea have not yet extended their jurisdiction on fishing, and Japan, as a counter-reaction, has not applied her extended jurisdiction to these countries. Under these circumstances, the joint regulatory zones have been established in parts of the Yellow Sea and East China Sea by China-Japan and Japan-Republic of Korea fisheries agreements for managing the shared stocks of both demersal and pelagic species. However, these joint regulatory measures cover only a part of the distribution of the stocks as the major part generally falls in the coastal zone where the national jurisdiction of each country applies.

NORTHEAST PACIFIC (Area 67) (Table 13)

The total catch from this area declined drastically during 1977-78 due mostly to the large reduction in the catch by non-coastal fisheries in conjunction with the extension of the national jurisdiction on fishing, by the two coastal countries - Canada and the USA. During the past three years it has recovered and has become fairly stable, with catches of about 2.2 million tons. This is almost equivalent to the level before 1977. The area is one of the major fishing areas in the world, ranked sixth, and accounting for about 3-5% of the total world marine catch.

The production from the area is distinct in its high component of demersal fish, 70-75% of the total. It is notable, on the other hand, that the US fishery catch has been steadily increasing, while the Canadian catch has been stagnant. The US catch exceeded 1 million tons in 1983, accounting for about 41% of the total catch. The rapid increase in the US catch was chiefly stimulated by the expansion of joint ventures with Japan, Republic of Korea, Poland and the USSR.

The abundance of salmon in the major stocks in the area has continued to increase in recent years and the net return of pink salmon in Bristol Bay recorded its highest level in 1983, 37.3 million fish were caught out of a stock of about 45.7 million. Sockeye and chum salmon also showed similar increases in many rivers, which had undoubtedly resulted from the success of re-stocking programmes through the artificial improvement of the spawning and nursery environments.

Halibut stocks are the second most important resource for the coastal fisheries in terms of value. They are closed to fishing by vessels of non-coastal countries. The stock, depleted during the sixties and early seventies, has been recovering since around 1975. It appears that the juvenile stocks, being supported by a few strong year classes, have further recovered in 1983, though the adults have still remained at a low level due to their slow growth rate and long life-span. This recovery seems to have been derived firstly from the preservation of spawning stocks from both the longline and trawl catches and, secondly, from the protection of juvenile fish against the incidental catch by trawl fishing. It is quite likely that the abundance of the entire stock will recover more rapidly in the near future as these controls will be continued.

The abundance of the stock of yellowfin sole in the eastern Bering Sea, which declined during the 1960s, is now at a high level which is comparable to that before the 1950s. The MSY is estimated to be about 150 000-180 000 tons. The allowable catch, however, has been fixed at a low level, about 120 000 tons to be on the cautious side. The other flat-fishes in the area, such as Greenland turbot, arrowtooth flounder, rock-sole, flathead sole, Alaska plaice and others, also appear to have been in good shape in recent years. These stocks seem to have been moderately exploited.

Continuous high production of Alaska pollack is one of the high-lights of the area. The total catch has been kept at bout 0.9 million to 1.3 million tons in recent years, with the exception of a temporary decline during the late 1970s during the transitional phase to the new regime of the sea. Alaska pollack accounts for about 45-50% of the total catch from the area showing both the huge biomass of the stock and importance of both the coastal and non-coastal fisheries. The catch of Alaska pollack by the USA has rapidly increased to about 200 000-300 000 tons, being supported chiefly by a joint venture with the Japanese. The stock appears to have been at a high and fairly stable level during recent years. The MSY is estimated to be about 1.2 million to 1.6 million tons.

The presence of a large amount of a pelagic form of Alaska pollack has been established in the Aleutian Basin of the Bering Sea by joint research between Japan and the USA. The estimated total biomass of the stock ranges between 1.3 million and 5.5 million tons and inhabits the 30-150 m layer of the sea during the feeding season in summer. During the spawning season, mid-late February, the fish move down to 200-300 m, and concentrate in the southeastern part of the Basin. They are composed mostly of larger and older fish, 38-54 cm body length and 5-7 years old. The relationship between the pelagic and demersal forms of the fish is not known; however, it is likely that they both intermingle during their younger stages on the continental shelf in the eastern Bering Sea. If this is the case, the pelagic stock can be regarded as a reserve spawning stock protected from the fishing mortality on the continental shelf in the eastern Bering Sea.

North Pacific hake and sable fish stocks appear also to be generally in good condition, however, the allowable catch for each has been set at a low level, as many biological features of these stocks are not known.

The Pacific Ocean perch stocks were depleted by heavy fishing during the 1960s and have remained at a very low level since then. Due to its specific biological features - extremely slow growth, late maturity with low fecundity and a long span of life, the recovery of the stock would take a long time in spite of several strict management measures having been imposed on the fishery. In fact, a clear recovering trend has not yet been confirmed, although it is more than 10 years after the initiation of such regulations. However, faint indications of increasing abundance have been observed in recent years.

Pacific herring is the only coastal pelagic fish resource being exploited in the area. A full analysis of the state of exploitation has not been carried out; however, it appears that most stocks are in a healthy condition. The recent catch has been substantially lower than before and well below the estimated MSY. This may have been chiefly due to reduced fishing resulting from the stagnant international trading situation, especially for raw herring for the Japanese market.

The area is characterized by its extremely low production of coastal pelagic fish due mainly to the environmental/oceanographic condition. The other pelagic fish which could be harvested in the future are not many, but probably include Pacific saury (Cololabis saira) and Pacific pomfret (Brana japonica), though the latter tends to be oceanic.

King crabs in the eastern Bering Sea and the northern Gulf of Alaska have been seriously depleted by overfishing during the late 1970s and early 1980s. The catch has drastically declined since 1981 and the fishing fleet has been reduced. This is one of the major reasons why the US joint ventures with non-coastal countries have increased rapidly, as mentioned previously. Strict regulatory measures, including the complete closure of major fishing grounds, have been imposed since 1983; however, it would need a lengthy period to restore the resources, as king crab is also a slow growing and late maturing species.

It is considered that Pacific snow crab stocks in the eastern Bering Sea have also been heavily exploited, due partly to a shift of target species from king crab. The catch, which in recent years has been substantially lower than the estimated MSY can be expected to decline further in the immediate future until regulatory measures come into effect.

Pacific Ocean shrimp stocks are also reported to have been seriously depleted by overfishing, especially in the Gulf of Alaska. Although adequate assessments of the stocks have not been made, it is believed that the overall abundance of the shrimps would fall precipitously if the major stocks were submitted to heavy fishing. These shrimps (Panadalus spp.) are extremely sensitive to heavy fishing, even if it is limited to the larger individuals, due largely to the sex reversal from male to female that occurs round the mid point of their lives.

In the area there are two managerial bodies that have been established for many years; they are the International Pacific Halibut Commission (IPHC) and the International Pacific Salmon Fisheries Commission (IPSFC). Both the Commissions are composed of Canada and the USA, the former deals with research into, and management of, Pacific halibut resources in the entire area, while the latter is concerned with the sockeye and pink salmon resources in, and adjacent to, waters of the Fraser River System. The fishing for halibut and salmon in this area by other nations is completely prohibited.

The responsibility for the management of most of the other resources falls, as in other areas, within the national jurisdiction of the coastal countries, Canada and the USA. Fishing by non-coastal countries in these waters has been defined and governed by bilateral agreements established between the coastal and each of the non-coastal nations. Several agreements with Bulgaria, German Democratic Republic, Poland and the USSR were operating in 1983.

The International North Pacific Fisheries Commission (INPFC), which is composed of Canada, Japan and the USA, is not a managerial body in principle, but has played an important role in the implementation of various management measures required by the coastal states. The Commission holds a meeting of the Standing Committee on Biology and Research every year, just prior to their Annual Meeting, when most major resources in the convention area - salmon, groundfish, pelagic fish, crabs, etc., - are assessed. The results of the assessments are then used by the coastal states in deciding on the regulatory measures for the coming fishing season.

WESTERN CENTRAL PACIFIC (Area 71) (Table 14)

The total catch from the area increased gradually during the past ten years and reached about 6.1 million tons in 1983, which is the fourth largest catch among the fishing areas, and accounts for about 9% of the world total marine catch. The area, which falls entirely in the tropics, comprises two different environmental regimes, namely, the neritic zone with extensive continental shelves along the Asian countries in the west, and the oceanic zone with very steep continental slopes and many reefs and atolls round the large number of island countries and along the north-eastern parts of Australia and Papua New Guinea in the east. The number of countries involved in the fishing in the area is 27, comprising 22 coastal and 5 non-coastal nations.

Four of the non-coastal fisheries (USA, Japan, Republic of Korea, and Taiwan, Province of China) are almost exclusively engaged in fishing for skipjack and larger tunas. In addition, the USSR has been engaged in some coastal fishing for both demersal and neritic pelagic fish in the area, but no details are available. The catch of these non-coastal countries accounts for 5-6% of the total catch from the area, while the 14 oceanian island countries contribute some 2-3% and the Asian countries 90-93%.

Among the Asian countries, Thailand, Indonesia, the Philippines and Malaysia have substantially expanded their fisheries during the past ten years; however, landings by Thailand have shown only a small increase since the late 1970s which may indicate the fully exploited status of the resources. The combined catch of these countries in 1983 reached about 5.1 million tons or about 90% of the total Asian catch (1.7 million, 1.4 million, 1.3 million and 0.7 million tons in each country, respectively). These Asian fisheries are characterized by their strong dependence on demersal fish resources and have a dual structure with both small-scale (artisanal) and large-scale (industrial) fisheries.

The nominal total demersal fish catch of the area has levelled off at around 630 000-640 000 tons annually since the late 1970s. Most stocks in nearshore waters have already been heavily exploited, with the probable exception of stocks in the northern Arafura Sea. The worst situation is in the inner Gulf of Thailand, which is seriously overfished, followed by the Strait of Malacca, the shallower part of the Java Sea and the inner seas of the central Philippines. An increase in the total catch is not expected from these waters, but even a decline if fishing is increased.

The demersal fish resources in offshore and deeper waters appear still not to have been fully exploited, probably with the exception of the inner Gulf of Thailand and the central to southern part of the Strait of Malacca. However, the intensification of fishing on these offshore resources has been hampered firstly by the problems of extending the artisanal fisheries to deeper and more distant waters, and secondly, by the less productive nature of offshore demersal resources for the industrial fisheries in terms of both the quantity (catch rate) and commercial value. Thus, the small-scale fishery tends to cling to the inshore zone and the large-scale

fishery invades the shallower waters where serious conflict between these two fisheries arises, which undoubtedly accelerates the further deterioration of inshore demersal resources. A greater catch of demersal fish from the region would not therefore be realized unless the appropriate management scheme is applied to the entire resources; namely, the application of a combination of a reduction in total fishing intensity, size regulations and the closure of specific grounds and seasons, specifically in connexion with the spawning and nursery areas of the major stocks in the nearshore waters and the well-designed and controlled expansion and/or transfer of fishing to offshore waters.

The combined catch of the major coastal pelagic species (round scads, mackerels, sardines and anchovies) has increased slowly from about 1.1 million to 1.3 million tons during the past decade. The catches of mackerels (Rastrelliger spp.) and also of anchovies (Stolephorus spp., Engraulidae) and wolf herring (Chirocentrus spp.) show substantial increases during the period, by about 35-45% and 30-50%, respectively, while the catch of round scads (Decapterus spp.) has declined and that of sardines (Sardinella spp.) has remained about the same.

Assessment of the state of the pelagic resources of the area are hampered by the lack of adequate statistics, incomplete knowledge of the limits of the considerable number of stocks in the area, and in some cases, uncertain identification of the several species involved.

In this situation many assessments are still provisional. The round scad, which is a major source of cheap protein in the Philippines, is very heavily fished there, but it is not known whether it is fully exploited. Catches are still completely of immature fish. The three or more stocks of round scad fished in the southern South China Sea, Malacca Strait area and the Java and Celibes Seas are also heavily fished, but probably not fully exploited. The three common species of mackerel (Rastrelliger spp.) are preferred species and it is probable that the stocks along the western coast of the Gulf of Thailand and Malacca Strait area are fully exploited though there still appears to be some scope for increased catches from other stocks. Catches of sardines have more than doubled in ten years, reaching 467 000 tons in 1983, though the annual increase has slowed down. The stock of "Lemuru" in the Bali Strait is fully exploited, but there is no clear evidence about the state of the other stocks. There are many stocks of anchovies and several of these are known to be at least fully exploited.

Almost all the prawn/shrimp stocks in the Asian waters are heavily or fully fished, with the possible exception of some stocks in the Arafura Sea (Indonesia). Catches of many stocks of Penaeus spp. have levelled off at about 150 000 tons during the past decade. Increases in the catches from these species cannot be expected in the future, and there may be a decline in some due to overfishing. Two problems of the shrimp fisheries are: (a) the large loss of juvenile prawns/shrimps discarded from catches of both aimed and non-aimed fishing, and (b) the large numbers of juveniles of commercial valuable fish discarded by the coastal shrimp fisheries.

Cephalopods are probably the only major resource in the Asian waters for which there is still ample room for increasing fishing, with a potential annual catch of several hundreds of thousands of tons. The catch has been growing steadily in recent years, but is still 160 000-180 000 tons per year. Squids are still caught mostly by trawl as a by-catch, which has probably reached its ceiling but the pelagic squids have hardly been utilized. The dipnet fishing with luring lights recently developed in Thailand is a step in the right direction.

Fishing for octopus has been virtually non-existent in the region. The current catch remains at only several thousand tons, though the potential catch is believed to be substantial. The introduction of suitably aimed fishing methods for catching octopus is needed, and the recent development of the octopus pot-fishing in Australia is therefore encouraging.

The coastal fish resources of Australia and Papua New Guinea, for both demersal and pelagic species are believed not to have been fully exploited and greater catches are expected in the future.

The state of the stocks of oceanic tunas fished in this area are covered in the review of the tunas, but mention should be made that the development in the Philippines of fishing for juvenile skipjack and yellowfin by large purse seiners using rafts and lights, which expanded very rapidly since around the mid-1970s, appears now to be slowing down and may be less of a threat to the stocks than was feared.

Small tunas of several species are common in most coastal waters and, while they are extensively fished, the stocks appear still to be only moderately exploited.

Many countries in the area, and especially the Oceanian ones, have substantial areas of coral reefs. Reef fish are generally of commercial value and very sensitive to heavy fishing. The experiences of some Asian countries (Philippines, Malaysia, Thailand) show that where the coral reef is located within easy access, the reef fish resources have already been fully exploited. Further careful research and monitoring of the reef resources are required.

There has been no multi or bilateral arrangement in the area made so far to deal with resources management. The Indo-Pacific Fisheries Commission (IPFC) of FAO and the IPFC Committee for the Development and Management of Fisheries in the South China Sea (CDMSCS) cover well the geographic area, the countries and the subjects relevant to the development of fisheries in the area. However, neither the Commission nor the Committee have administrative powers, but only consultative responsibilities. The activities of the IPFC Standing Committee on Resources Research and Development (SCORRAD) are limited to consultation on resource research.

EASTERN CENTRAL PACIFIC (Area 77) (Table 15)

The increasing trend in total catches reported in previous years reversed in 1982 and 1983. After reaching a maximum of 2.7 million tons in 1981, catches in 1982 dropped to 2.3 million tons and this dropped further to 1.6 million tons in 1983. The area in general was seriously affected by the 1982-83 "El Niño" phenomena which was one of the strongest anomalies of its kind in the century. This affected the overall distribution of fish, as well as the local and overall abundance of some key resources such as mackerels, pilchards, anchovies, shrimps, etc., and affected fisheries in the whole area.

One of the fisheries most seriously affected was that for mackerel (Scomber japonicus) off Ecuador. Catches of mackerel, which were erroneously reported as Pacific thread herring in previous years, reached a maximum catch of 700 000 tons in 1981, then due to the "El Niño" in 1982-83 catches dropped to 280 000 tons in 1982 and to 134 000 tons in 1983. Apparently the stock of mackerel migrated south during the El Niño phenomenon, moving away from the Ecuadorian fishing grounds.

The total catch of Californian pilchard (Sardinops caerulea) increased from 340 000 to 430 000 tons in 1982, but dropped to 316 000 tons in 1983. This stock is only being exploited by Mexico, although it can also be found off southern USA. Catches of North Pacific anchovy dropped from a maximum of 424 000 tons in 1981 to 365 000 tons in 1982, and dropped further to 237 000 tons in 1983. Most of these catches in 1983 were made by Mexico, since catches by the USA, the only other country exploiting this stock, decreased from 470 000 tons in 1982 to only 4 000 tons in 1983.

Catches of Central Pacific anchoveta (Cetengraulis mysticetus) mainly by Panama continue to fluctuate. After reaching a maximum of 172 000 tons in 1980, catches dropped to 110 000 tons in 1981 and to 77 000 tons in 1982, to increase again to 160 000 tons in 1983. Catches of unidentified fish, which increased dramatically over the last few years, reaching a maximum of 300 000 tons in 1981, dropped to 170 000 tons in 1982 and to 46 000 tons in 1983. Most of these changes were due to the catches of unidentified fish reported by Mexico.

Catches of tuna also dropped slightly in 1982-83. Catches of skipjack tuna (Katsuwonus pelamis) were down to 122 000 tons in 1982 and to 79 000 tons in 1983 after being 147 000 tons in 1981. Catches of yellowfin tuna (Thunnus albacares) also went down from 167 000 tons in 1981 to 137 000 tons in 1982 and to 116 000 tons in 1983.

Following the normalization of the oceanographic conditions late in 1983, Ecuador started to report a relatively high abundance of jack mackerel (Trachurus murphyi) that allow the Ecuadorian fleet to catch about 25 000 tons of this fish in only a couple of months by the end of 1983. This is an unusual event, associated with the regression of El Niño, since high concentration jack mackerel has not been reported before in such low latitudes.

Exploitation of the squat lobster (Pleuroncodes planiceps) was also reduced after reaching a level of 14 000 tons in 1981, catches were reduced to 7 000 tons in 1982 and to 3 200 tons in 1983.

There are no FAO regional bodies in the area. At the moment research and management of tuna in the area is coordinated by the I-ATTC based in La Jolla, but not all the countries in the area are members of this body. Regional cooperation for the development of fisheries in the area is being promoted by the Action Committee for Marine and Inland Water Products of the Latin American Economic System (CAPMAD-SELA) (now OLDEPESCA), of which most of the Latin American coastal states bordering Area 77 are members. Also in the south of Area 77, Ecuador and Colombia cooperate in fisheries and other marine research and conservation issues within the framework of the CPPS, of which Chile and Peru (Area 87) are also members.

SOUTHWEST PACIFIC (Area 81) (Table 16)

This area includes New Zealand, a few island communities and a large area of deep open ocean. Most of the fishing is done in the vicinity of New Zealand by New Zealand boats and by vessels from Japan, the USSR and the Republic of Korea. Total catches for Area 81 have continued their upward trend and reached 432 000 tons in 1983.

Catches of coastal demersal fishes round New Zealand have remained very constant around 180 000 tons for the last three years inspite of increased fishing effort, indicating that the major demersal stocks are almost certainly fully exploited; however, the statistics on catch and effort are considered inadequate to make satisfactory stock assessments.

Catches of small pelagic species in the area have been increasing steadily and reached 37 000 tons in 1983. These stocks are lightly exploited and catches could be increased very substantially.

The New Zealand Fishing Industry Board is responsible for the management of fisheries under New Zealand jurisdiction, and largely through a licensing policy has been able to stabilize the fisheries of rock lobsters and of oysters at good economic levels; however, scallops are considered to be severely overfished. The Board has also established a management policy for deep-water fisheries. Foreign vessels are licensed and given allocations of finfish and of squid that may be caught. This seems to be working satisfactorily.

Skipjack and albacore are lightly fished in the area and catches could be substantially increased.

Although cephalopods at present come second in importance in the area, with annual catches of between 60 000 and 70 000 tons in recent years, they probably are one of the stocks capable of considerably increased catches, with up to 40 000 tons in coastal waters and substantially more in oceanic waters.

SOUTHEAST PACIFIC (Area 87) (Table 17)

This area was the most seriously affected by the 1982-83 El Niño phenomena. Total catches continued to increase from 6.8 million tons in 1981 to 7.9 million tons in 1982, but they dropped to 6.2 million tons in 1983. Fisheries for sardine (Sardinops sagax) continues to be the biggest fishery in the area. After several years of continuous growth in overall abundance and total catches, the growth of the fisheries apparently came to a halt. After reaching a maximum of 3.3 million tons in 1979, total catches of sardine dropped to 3.2 million tons in 1980 and to 2.8 million tons in 1981. In 1982 and 1983 catches increased again to 3.3 million tons and to 3.9 million tons, respectively. This seems to be related to the effects that the 1982-83 El Niño had by displacing south and concentrating inshore the stock of sardines, thereby allowing higher catch rates to be obtained; thus causing an overall increased in total catches which do not seem to be related to a real increase in overall abundance. Moreover, as a consequence of changes in the vertical and horizontal distribution of the sardine stocks, catches of the two main fishing nations changed dramatically. While in previous years around 45% of the sardine catches were coming from Peruvian waters and 55% from Chilean waters, the southern shift experienced in 1983 caused the Peruvian catches to decrease to 1.1 million tons (27%) while the Chilean catches increased to 2.8 million tons (73%). There are signs that this stock is at least fully exploited.

Jack mackerel is the second species of importance in terms of total catch by weight. The stock has been growing and apparently is now bigger in terms of total biomass than the sardine stock. Catches of jack mackerel continued to increase from 1.7 million tons in 1981 to 2.2 million tons in 1982 and then dropped to 1.6 million tons in 1983. This stock is being exploited inshore by Chile (865 000 tons in 1983) and Peru (40 000 tons in 1983) and offshore by long-range fleets from the USSR, Cuba, Poland and Bulgaria. Most of the offshore catches are made by Soviet fleets (590 000 tons in 1983). This stock is moderately exploited.

The overall abundance of anchoveta, once the main fishery in the region, continues to decrease, particularly after the latest "El Niño". Catches of anchovy increased to 1.8 million tons in 1982, but this was mainly due to changes in distribution pattern induced by the offset of the El Niño, but the total catches dropped to only 126 000 tons in 1983, the lowest level ever recorded since the anchoveta fishery started more than 30 years ago. The total biomass of anchoveta was reported to be less than 1 million tons in 1983 after the El Nino. Most of the catches of anchoveta are made by Peru.

Another species of major importance is mackerel (Scomber japonicus) which is being exploited inshore by Peruvian and Chilean fleets and offshore is exploited by Soviet fleets and to a lesser extent by Cuba, Bulgaria and Poland. Catches of mackerel were above 200 000 tons until 1980, and then dropped to 176 000 tons in 1981, to 84 000 tons in 1982 and 33 000 tons in 1983.

The four pelagic species mentioned above make up more than 90% of the total catch in this area. The main demersal stock being exploited in the area is hake (Merluccius gayi) which has two stocks - one off Central Chile and the other off Northern Peru. After a period of great fluctuation, catches of hake have dropped continuously since 1980. From 191 000 tons, catches of hake dropped to 103 000 tons in 1981 to 50 000 tons in 1982 and to 30 000 tons in 1983. The country most seriously affected by this recent drop in catches was Peru; its catches dropped from 160 000 tons in 1980 to 4 400 tons in 1983. The exploitation rate of this stock has been fluctuating over the past few years and it has probably gone through periods of heavy exploitation in the past. This fishery was also affected by the El Niño, particularly off Peru where there was an increase in the availability of Penaeus shrimps (catches went up from 600 tons in 1981 to 2 100 tons in 1982 and to 11 000 tons in 1983) which caused a shift of part of the fishing effort from hake to shrimp. It is foreseen that catches of hake can be increased in the near future.

Other demersal species of importance in the area are the Patagonian hake (Merluccius polylepis), with a total catch of 31 000 tons in 1983, and Patagonian grenadier (Macruronus magellanicus) with a total catch of 22 000 tons in 1983. Catches of cusk eels (Genypterus spp.) are stable at 10 000 tons a year since 1979. Catches of South Pacific breams (Seriolella spp.) increased from 24 000 tons in 1981 to 32 000 tons in 1982, but then dropped to 6 000 tons in 1983. Catches of mullets (Mugilidae) continued to increase, 30 000 tons of this species were caught in Peruvian waters. Catches of Chilean sprat went up to 46 000 tons in 1982 but dropped to 19 000 tons in 1983.

Catches of Eastern Pacific bonito (Sarda chiliensis) continued to increase both off Peru and Chile. From 7 000 tons in 1978, catches of bonito have been increasing steadily to 24 000 tons in 1983. Fishing for squat lobster off Chile has recovered slightly to 15 000 tons in 1983 after a severe drop to 3 400 tons in 1980. There was also a slight increase in the scallop fishery, also probably associated with the El Niño. Landings of scallops increased from 3 000 tons in 1981 to 7 100 tons in 1982 and to 12 000 tons in 1983, most of which was caught in Peruvian waters.

Catches of squids increased slightly, but they are still well below the potential yield which is estimated at a few hundred thousand tons, although it should be noted that this is subject to a high variability. Saury also seems to be abundant in the region, but attempts to exploit them have not been promising.

There are two regional bodies in this area that are active in fishery matters: the Permanent Commission for the Southeast Pacific (CPPS) with headquarters in Quito, Ecuador, and the Action Committee for Marine and Inland Water Products of the Latin American Economic System (CAPMAD-SELA) with headquarters in Lima, Peru, replaced since October 1984 by OLDEPESCA (Organización Latino-americana para el desarrollo de la pesca).

The CPPS was established in 1952: its members are Chile, Peru, Ecuador, and Colombia. This body deals with marine aspects in general, and has been active in promoting regional cooperation in research and monitoring of fisheries and of fishery-related environmental studies such as the "El Niño". OLDEPESCA has the task of promoting the development of fisheries in the region, and most Latin American countries are in the process of joining it. CAPMAD/SELA was instrumental in the execution of a

regional project to assess the stocks of sardine, jack mackerel and mackerel in the Southeast Pacific. This project was partially funded by IDB and had the active participation of Chile, Peru and Ecuador. This project started in September 1981 and ended in June 1984, although efforts are being made to have an extension.

SOUTHERN OCEANS (Areas 48, 58 and 88) (Table 18)

Annual catches of fish from the Southern Oceans have continued to increase slowly after they crashed in 1972/73 when the accumulated virgin stocks were fished down. Catches reached 197 000 tons in 1982/83, under half of the 430 000 tons of largely Antarctic cod that was harvested at the start of the fishery in 1969/70. During these 11 years of increasing catches the fishing has been switched from one species to another and in the last three years the Antarctic icefish (Champsocephalus gunnari) has increasingly dominated the catches, reaching over 80% of the landings in 1982/83. With a lack of fishing effort data and only broad identity of the areas fished, it still is not possible to make meaningful assessments of the stocks. However, it is considered that there is not much scope for substantial increases in annual catches.

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has in the past made several management recommendations, including minimum mesh sizes and minimum sizes of fish to be landed, and although there is no power to enforce them, the acceptance of these measures is a useful first step. During its 1984 meeting CCAMLR requested all parties to refrain from direct fishing on Notothenia rossi and avoid by-catches of this species. It also adopted its first conservation measures regarding closed areas within 12 miles off South Georgia and mesh size regulations for Notothenia and associated species.

The catch of krill has continued to rise rapidly since the start of the fishery in 1973/74 until this last season, when it fell from the maximum of 529 000 tons in 1981/82 to less than half in 1982/83 and 1983/84. This decrease was due wholly to a major reduction in fishing for krill by the USSR, but the USSR has been the largest catcher of krill with the result that their share of the total catch fell only from 93% to about 80%.

OCEANIC TUNAS AND BILLFISHES (Table 19)

Total catches of all species of tunas have remained remarkably stable since 1978 at about 2.6 million tons though within this total there have been some changes in the catches from individual stocks. These changes have largely come from changing patterns of fishing in various countries in response to crises, such as increased fuel costs, extension of jurisdiction and markets.

Significant development have been observed particularly over the last three years in the world tuna fishing industry.

The price of fish, especially for those processed in canneries (skipjack and yellowfin) has been declining drastically since 1982. The market for canned tuna, particularly in the USA, has slumped badly; combined with increased catching capacity in the Western and Eastern Pacific, this has led to severe economic problems, both in developing countries attempting to build up domestic tuna fisheries, and in those developed countries with long established tuna fisheries.

The distribution of the catches has changed notably in 1983 and 1984, with large catch increases in the Indian Ocean and the Western Pacific mostly due to shift of large purse seine fleets from the Atlantic and the Eastern Pacific.

As a result, the major tuna landing places have changed too and several new coastal countries are developing their own processing sector (Philippines, Indonesia, Thailand, etc.), while some of the biggest US Californian canneries have closed due to strong price competition.

The distribution of the catches among the major fishing methods is continuously changing. Pole and line and longline have been reduced since 1981, while purse seining is increasing; this resulted in increased catches of small yellowfin and skipjack, while catches of big yellowfin, albacore and billfishes are being progressively reduced due to decreasing effort of the longline fleets.

The specialized Japanese Sashimi market continues to attract a lot of attention because of the extremely high prices. It is, however, limited in size and requires that the fish are handled carefully. As a result fishing effort on the major species concerned with this market (mostly the cooler water bigeye and bluefin) has remained very intense.

Adjustment to the new regime of the sea has been important in several areas. In the Southwest Pacific the interlocking exclusive economic zones of the several island states cover nearly all the area, so that it is not practicable to operate long-range tuna fleets solely on the high seas. Since only a few of the countries can operate significant fisheries of their own, the question has been one of determining suitable conditions under which distant-water fleets can operate within the EEZs of the various island states.

As a result of extended jurisdiction, it has been extremely difficult in the last few years for tuna scientists to gain access to detailed catch and effort statistics for stock assessment, particularly in the Western Pacific. Governments as well as tuna companies are often reluctant to release detailed catch and effort statistics because of the use that could be made of this information, e.g., in access negotiations.

At the same time, there is an increasing need to monitor the tuna stocks of the Western Pacific and to carry out stock assessment since the present situation suggests that some complex fishery interactions are taking place, i.e., interaction between purse seine and longline fisheries, effect of the tremendous increase in catches of the juveniles of yellowfin and skipjack with the development of purse seine fishing on fish aggregating devices and logs, etc.

International cooperation in tuna management takes place through several Commissions as the Indian Ocean Fishery Commission (IOFC), Indo-Pacific Fishery Commission (IPFC), International Commission for the Conservation of Atlantic Tunas (ICCAT), Inter-American Tropical Tuna Commission (I-ATTC).

In the Indian Ocean and the Western Pacific, the IOFC Committee on Management of Indian Ocean Tuna and the IPFC special Committee on Management of Indo-Pacific Tuna are responsible for reviewing the state of the stocks and the measures that might be considered for management and development planning of the tuna fisheries.

In the Southwest Pacific, stock assessments are also carried out by the South Pacific Commission, while the South Pacific Forum Fisheries Agency has been set up to advise its member countries on a wide range of technical and policy matters related to the use and management of the resources in the region. It also facilitated the harmonization of regimes and has established a registry of foreign vessels fishing in the region for tuna.

In the Eastern Pacific, I-ATCC reviewed the status of the "Eastern Pacific Ocean Tuna fishing agreement". the new agreement initially signed by Costa Rica, Panama and the USA in 1983 is now in the process of ratification and will enter into force when at least five coastal states have ratified it.

The new regime has changed drastically the nature of the responsibilities and powers of the existing Commissions and in these circumstances, relatively little attention has been given to immediate questions of management or of new assessments of the stocks. There are exceptions. In the Northwest Atlantic, continued concern has been expressed about the state of the bluefin tuna which, because of its potentially long life span and vulnerability to a succession of fisheries over most of its life, is more susceptible to overexploitation than the other species of tuna. ICCAT has therefore recommended strict controls on the catch of these species.

Independently from these Commissions, continued monitoring may also be carried out for some heavily fished stocks within direct agreement between the fishing countries, i.e., assessment of Northern Pacific albacore (USA and Japan) and southern bluefin tuna (Australia, Japan, New Zealand).

In the Southwest Pacific, the results of the very extensive tagging experiments carried out, principally on skipjack, by the South Pacific Commission, are now becoming available. It appears that the stock in the area is very large, though exact quantitative interpretation of the results is difficult. Though some fish moved over long distances, the great majority of fish were recaptured in the exclusive economic zones of the same country as that in which they were tagged. This suggests that for this specific species events in one exclusive economic zones do not greatly influence those in others, and that, for resources management purposes, it is desirable, but not essential, that measures taken by one country are coordinated with those taken by others.

For most of the other species, international collaboration will remain necessary to study the complex sets of interactions occurring between fishing gears or between the bordering areas.

C. REGIONAL REVIEWS OF INLAND WATER RESOURCES

Clear estimates of the quantity of fish produced from inland waters and aquaculture are hard to obtain because of the manner of reporting these items in various countries. Estimates of aquaculture production often include fish from brackish and marine sources. Furthermore, yields from inland capture fisheries are not always separated in their entirety from reared fish. Thus, despite a trend to increasing catch from inland waters in all continents, it is not clear whether this is due to an expansion of aquaculture or to an improvement in the management of the fresh waters and their fisheries.

The history of catches of fish from the inland waters of the various continents of the world is given in the table below, which shows there to have been an overall increase in production of some 20 percent over the six years under review.

Production of fish by inland fisheries
and aquaculture for the various continents (1978-82)
based on nominal catch statistics

Continent	Catch ('000 t)					
	1978	1979	1980	1981	1982	1983
Africa	1434	1434	1402	1400	1465	1476
America, North	153	153	173	227	261	253
America, South	273	221	280	292	314	323
Asia	4086	4248	4563	5017	5184	5258
Europe	311	320	372	375	398	405
Oceania	2	2	2	2	3	4
USSR	725	805	747	806	804	804
TOTAL	6844	7097	7422	8041	8400	8653

AFRICA (Area 01)

Catches in Africa declined slightly from 1978 to 1981 but have risen to their original values in the last two years. This seeming stability conceals a series of shifts within the continent. Theoretical calculations of potential fish yield from the inland waters of the continent predict maximum yields of the order of 3.4 to 3.9 thousand tons. In fact it is doubtful whether this level of production can ever be attained although there are still several fisheries which, because of their isolation or for socio-economic reasons, remain little utilized. These include the Okavango swamps, the central swamp systems of the Congo/Zaire River, the Ethiopian rift valley lakes and the pelagic resources of Lake Tanganyika, and perhaps those of Lake Victoria.

There has been a serious depletion of fish stocks in many parts of Africa due to changing climatic conditions. This has been particularly marked in the Sahelian zone where Chad, Niger, Mali and Senegal have been the most affected with the virtual cessation of the floods of the Niger, Senegal, Logone and Chari Rivers and with the continued desiccation of Lake Chad. Most other countries in the region have also been involved to a certain extent. The other significant changes in capture fisheries have resulted from some species transfers. The introduction of Nile perch (Lates niloticus) into Lake Kyoga in Uganda has resulted in the conversion of this previously highly productive multi-species fishery into one based upon three-species only with a resulting long-term drop in catch. The fisheries of Lake Victoria appear to be following a similar history, with the introduced predator increasingly dominating the catch which is still increasing as part of the early phase of predatory expansion. The history of Lake Kivu following the transfer of Limnothrissa miodon from Lake Tanganyika has resulted in the creation of a new fishery of modest yield.

NORTH AMERICA (Area 02)

Catches have remained stable throughout much of the North American area over a considerable period. In the USA and Canada emphasis on commercial catches is relatively low and the resources are utilized mainly for recreation. Recent attempts at improving the quality of the environment for fish, and particularly efforts to reconstruct the salmonid fauna of the Great Lakes should eventually raise the potential from these waters. Production from the inland waters of Mexico has increased over six times in

the period under review. Much of this apparent increase may be the result of better statistics but there is no doubt that there has been increased attention to inland fisheries. Furthermore, there has been a considerable expansion in the aquaculture sector during the same period. Intensification of aquaculture and improvement in the management of small dams also accounts for the doubling of inland fish production in Cuba.

SOUTH AMERICA (Area 03)

Catches of fish from the inland waters of South America continue to increase because of the rising emphasis on fish as a relatively cheap source of animal protein. There have been further expansions of the fisheries of the Amazon, Orinoco and Paranå basins although some of the older fisheries such as those of the Magdalena River in Colombia have declined due to pollution and other environmental pressures. The creation of many new dams and impoundments throughout the continent has also increased the potential for fish production.

Despite these recent increases in catch, the actual production from the continent remains very low when compared with the estimated potential of about 1 500 000 tons from capture fisheries in lakes, rivers and coastal lagoons. Some of the shortfall is probably due to poor recording of data, particularly on the subsistence and artisanal sectors of the fishery, although there is no doubt that local food preferences have resulted in the neglect of fisheries resources until recently.

ASIA AND THE PACIFIC (Areas 04 and 06)

Asia continues to produce the majority of fish of freshwater origin, about 60 percent of the world total. This is mainly due to the widespread adoption of aquaculture, especially associated with rice culture, as natural inland water resources are confined to the major rivers and very few natural lakes. The resource base for capture fisheries continues to enlarge through the creation of dams and reservoirs but these are insufficient to account for the increase in catch of over 1 million tons recorded over the last six years. Four countries in particular, China, India, Indonesia and the Philippines have continued growth of inland fisheries throughout the period under review mainly through the expansion of aquaculture.

EUROPE AND USSR (Areas 05 and 07)

Production of fish from the inland waters of Europe and the USSR has risen by about 15 percent over the six years listed in the above table. Western European fisheries have increased somewhat faster than those of the USSR mainly because of a rapid increase in aquaculture in countries such as Britain and Finland. Increases in production have also been recorded from the countries of the Danube basin, where changes in the regime of the river, the creation of reservoirs and extensive aquaculture in the old floodplain water bodies all contribute to higher catches.

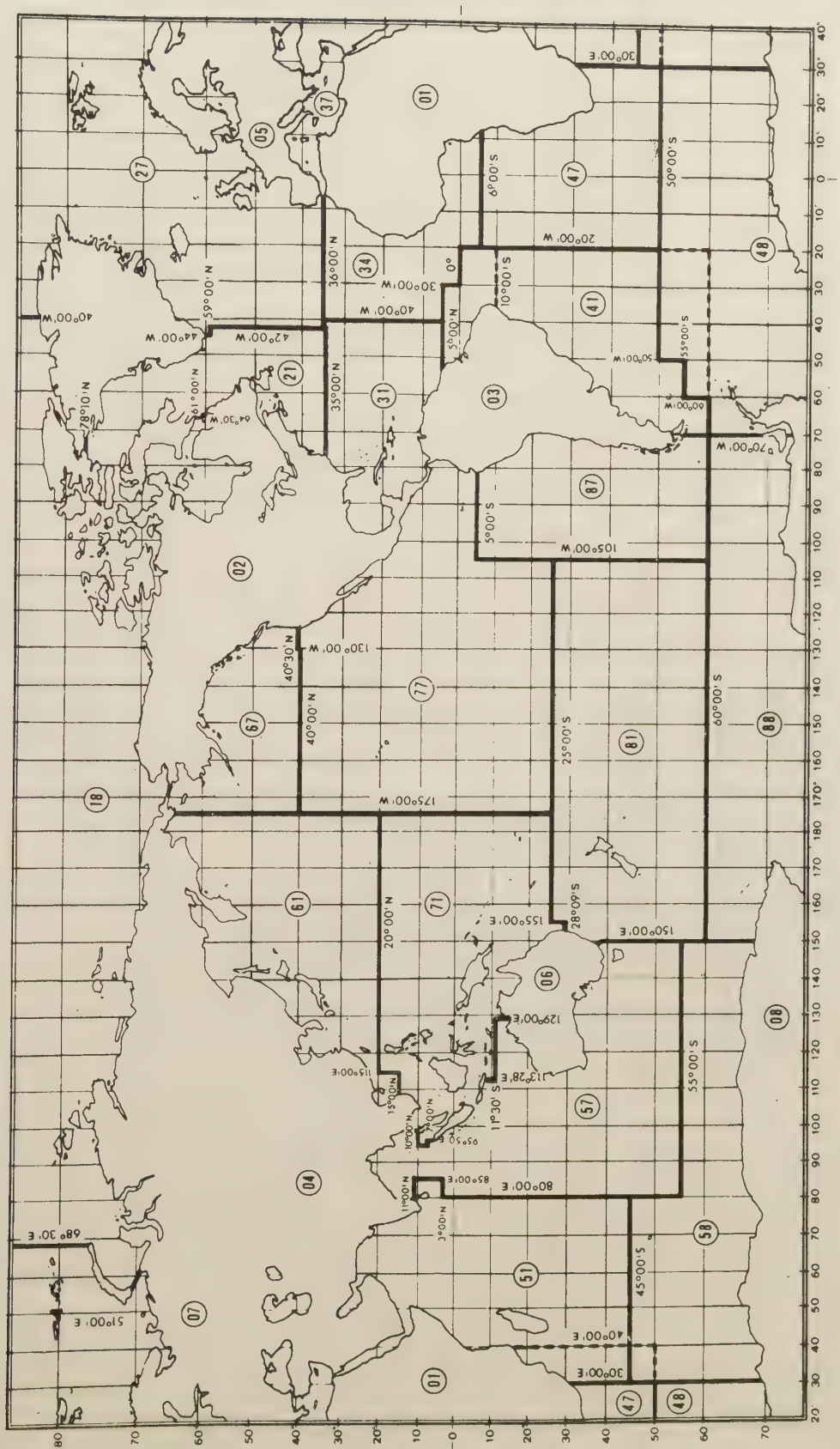
D. AQUACULTURE (FRESHWATER, BRACKISH AND MARINE)

The following table gives some estimates of the progress of aquaculture since 1975. The figures given include marine and freshwater finfish, shellfish and crustacea but exclude seaweeds.

Estimates ('000 tons) of aquaculture production
for freshwater and marine finfish, molluscs and crustacea

	1975	1980	1983
Africa	107	4	4
America N.	158	140	316
America S.	97	71	219
Asia & Pacific	3720	5135	6250
Europe & USSR	892	1141	1278
Total	4975	6490	8107

The table indicates the great growth of this sector over the last decade. It is difficult to gauge the precise contribution of aquaculture to the inland statistics but there is no doubt that in Asia and Europe such increases as have occurred have been primarily through cultured fish.



Major Fishing Areas for statistical purposes

Table 1

Annual world landings of aquatic resources (million tons)
(excluding mammals and seaweeds)

	1948-52	1953-57	1958-62	1963-67	1968-72	1973-78	1979	1980	1981	1982	1983
Total: All species	**21.9**	**29.0**	**39.8**	**53.9**	**67.1**	**68.2**	**71.1**	**72.0**	**74.8**	**76.5**	**76.5**
Inland waters	2.5	3.8	5.8	7.3	8.9	7.1	7.3	7.6	8.1	8.4	8.9
Anchoveta	0.0	0.1	3.7	9.0	10.0	2.8	1.4	0.8	1.6	1.8	1.3
Marine: less anchoveta	19.4	25.1	30.3	37.6	48.2	58.3	62.4	63.6	65.1	66.3	66.3

Table 2

Catches ('000 tons) by local and long-range fleets in selected regions in which fishing by countries outside the region is particularly important

Area	1970-74		1975-79		1980		1981		1982		1983	
	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range
NW Atlantic	**2014.5**	**2209.0**	**2125.8**	**1040.2**	**2560.3**	**307.1**	**2537.1**	**290.7**	**2507.3**	**294.7**	**2456.9**	**251.9**
% of total area catch	47.7	52.3	67.1	32.9	89.3	10.7	89.7	10.3	89.4	10.6	90.7	9.3
EC Atlantic	**1144.5**	**1935.4**	**1268.9**	**2108.6**	**1284.8**	**2147.6**	**1382.4**	**1855.6**	**1405.8**	**1800.5**	**1551.7**	**1620.8**
% of total area catch	37.2	62.8	37.6	62.4	37.4	62.6	42.7	57.3	43.8	56.2	48.9	51.1
SE Atlantic	**1710.8**	**1039.8**	**1212.0**	**1538.9**	**927.3**	**1243.3**	**982.0**	**1407.3**	**922.1**	**1437.1**	**1037.5**	**1310.4**
% of total area catch	62.2	37.8	44.1	55.9	42.7	57.3	41.1	58.9	39.1	60.9	44.2	55.8
NE Pacific	**509.7**	**1882.3**	**651.0**	**1407.3**	**797.1**	**1177.5**	**989.7**	**1383.6**	**1002.9**	**1157.3**	**1200.5**	**1291.5**
% of total area catch	21.3	78.7	31.6	68.4	40.4	59.6	41.7	58.3	46.4	53.6	48.2	51.8

Table 3

Northwest Atlantic (Area 21)

Stock	Estimated potential ('000 t)	Main fishing countries (1983)	Catches ('000 t) 1965	1970 -74	1975 -79	1980	1981	1982	1983	State of Exploitation
Atlantic cod	1350-1750	Canada, France, Greenland, Spain, USA	1462	972	538	598	617	704	697	Recovering
Red hake	50-100	USA, USSR	88	45	15	3	3	3	3	Fully exploited
Haddock	100-130	Canada, USA	249	35	42	80	83	67	55	Depleted
Saithe (=Pollock)	40-100	Canada, USA	38	34	43	56	58	54	48	Fully exploited
Silver hake	250	Cuba, USA, USSR	383	270	136	62	62	80	54	Fully exploited
Roundnose grenadier	30-100	Germany D.R., USSR	-	42	24	4	7	4	4	Moderately exploited
Atlantic redfishes	200	Canada, USSR	237	267	165	117	130	125	118	Fully exploited
Flatfishes	250-300	Canada, USA	209	284	238	231	216	210	207	Fully exploited
Other groundfish		Canada, USA	65	137	118	107	99	90	86	Moderately exploited
Capelin	500(?)	Canada, USSR	7	130	217	27	39	42	42	Depleted
Atlantic herring	300-1000	Canada, USA	266	612	320	260	224	180	166	Depleted
Atlantic menhaden	500*	USA	232	273	267	332	263	311	336	Fully exploited
Atlantic mackerel	0-400	Canada, Poland, USA	16	354	133	25	28	30	29	Underexploited
Other fish		Canada, Italy, USA	165	139	90	65	55	58	47	
Total fish	**3870-5630**		**3417**	**3595**	**2346**	**1967**	**1884**	**1958**	**1892**	
Crabs	Unknown	Canada, USA	41	46	50	72	97	106	97	Some stocks underexploited
American lobster	30	Canada, USA	32	30	33	37	39	41	48	Overexploited
Northern prawn	40	Greenland	5	12	41	45	41	43	45	Fully exploited
Other shrimp		Canada	1	13	9	13	16	13	14	Fully exploited
Total crustaceans			**79**	**101**	**133**	**167**	**193**	**203**	**204**	
American cupped oyster	Unknown	Canada, USA	149	173	146	156	156	118	78	Environmental impacts
Scallops	Unknown	Canada, USA	156	73	182	180	190	147	135	Overexploited
Clams	Unknown	USA	182	231	232	277	325	308	338	Fully exploited
Squids	Unknown	Canada, Japan, Spain	10	44	117	111	69	49	38	Moderately exploited
Other molluscs			-	6	9	8	10	18	23	
Total molluscs			**497**	**527**	**686**	**732**	**750**	**640**	**612**	
Others			...	1	1	1	1	1	1	
Total area			**4027**	**4224**	**3166**	**2867**	**2828**	**2802**	**2709**	

* Part of stock occupies Western Central Atlantic (Area 31)

Management measures. All important stocks are covered by catch quotas divided among countries fishing in the region. These quotas are set by the coastal state (Canada, USA and the European Economic Community) for waters within 200 miles and by the North Atlantic Fisheries Organization (NAFO) for waters beyond national jurisdiction. In addition to quotas, there are controls on effort, gear, area and season for various fisheries.

Note: The main fishing countries are listed in alphabetical order in this and the following tables.

Table 4

Northeast Atlantic (Area 27)

Stock	Main fishing countries (1983)	Estimated potential ('000 t)	Catches ('000 t) 1965	1970 -74	1975 -79	1980	1981	1982	1983	State of exploitation
Freshwater and diadromous	Finland, USSR		57	56	45	51	48	47	46	
Plaice	Denmark, Netherlands, UK	150	144	183	167	145	134	151	147	Fully exploited
Common sole	Netherlands	20-25	26	31	23	26	25	31	31	Fully exploited
Other flatfish	Denmark, France, Iceland, Netherlands, Spain	150	129	159	127	139	128	156	164	Fully exploited
Tusk	Norway	Unknown	38	32	34	49	39	41	41	Unknown
Atlantic cod	Denmark, Iceland, Norway, Poland, USSR	1500-2000	1300	1831	1714	1613	1729	1552	1373	Fully exploited
Lings	France, Norway, Iceland	Unknown	60	68	73	93	80	81	84	Unknown
Haddock	Denmark, Iceland, Norway, UK	400	499	601	385	296	334	356	314	Fully exploited
Saithe (Pollock)	France, Iceland, Norway	700	370	638	537	377	421	457	443	Fully exploited
Polar cod	USSR	Unknown	-	193	18	0	9	90	37	Unknown
Norway pout	Denmark, Norway	Unknown	77	523	540	581	346	533	548	Unknown
Blue whiting (Potassou)	Denmark, Norway, USSR	Unknown	18	41	407	1106	888	527	523	Moderately to fully exploited
Whiting	Denmark, France, UK	200-300	183	204	218	190	192	179	163	Fully exploited
European hake	France, Spain	100-150	123	97	76	64	63	59	66	Fully exploited
Other gadoids	France, Spain, USSR		50	39	52	63	49	51	54	
Sandeels	Denmark, Norway, UK	500	141	358	643	769	653	660	592	Fully exploited
Atlantic redfishes	F.R. Germany, Iceland, USSR	250-500	194	156	314	221	251	363	353	Fully exploited
Monk (Angler fish)	France, Spain	Unknown	28	35	37	54	44	52	57	Unknown
Other demersal fish	France, Iceland, Norway, Portugal, Spain		91	145	152	102	96	111	116	
Capelin	Iceland, Norway, USSR	2000	274	1668	2921	2563	2760	1802	2509	Fully exploited
Atlantic horse mackerel	Netherlands, Portugal, Spain	Unknown	124	279	234	137	156	187	166	Moderately exploited
Atlantic herring	Denmark, Finland, D.R. Germany, Poland, Sweden, USSR	2000-2500	3735	1373	784	677	737	803	976	Some stocks depleted others fully exploited
European sardine (pilchard)	Portugal, Spain	400	229	161	164	213	236	220	203	Moderately exploited
Sprat	Denmark	500-1000	176	402	748	604	495	449	327	Fully exploited
European anchovy	Spain	Unknown	130	35	47	24	12	5	17	exploited
Atlantic mackerel	Ireland, Netherlands, Norway, UK	500	302	482	724	620	593	576	572	Fully exploited
Tunas	Spain	50	75	52	46	41	35	43	49	Fully exploited
Other pelagic fish	Portugal, Spain		86	44	53	21	15	14	14	
Sharks	France, Norway	Unknown	64	71	63	56	47	48	57	Unknown
Skates	France	Unknown	44	29	26	27	36	29	30	Some species depleted
Other fishes	Denmark, France, USSR		166	217	177	100	220	238	142	
Total fishes			**8933**	**10203**	**11549**	**11022**	**10871**	**9911**	**10214**	
Crabs	France, UK	Unknown	14	25	33	34	33	33	35	Unknown
Norway lobster	France, UK	50	25	36	39	40	44	46	50	Fully exploited
Northern prawn	Iceland, Norway	25-50	20	20	33	62	56	72	103	Fully exploited

Table 4 (continued)

Stock	Main fishing countries (1983)	Estimated potential ('000 t)	Catches ('000 t) 1965	1970-74	1975-79	1980	1981	1982	1983	State of exploitation
Common shrimp	F.R. Germany, USSR	50	52	41	40	39	36	51	55	Fully exploited
Other crustaceans	France, UK		21	14	76	5	4	6	7	
Total crustaceans			**132**	**136**	**151**	**180**	**173**	**208**	**250**	
Oysters	France	100	68	68	99	108	92	86	120	Fully exploited
Blue mussel	Denmark, France, Netherlands, Spain	Unknown	236	293	289	357	367	429	402	Moderately exploited
Scallops	France, Iceland, UK	50	9	41	43	46	48	45	52	Fully exploited
Common cockle	France, Spain, UK	Unknown*	34	30	26	27	21	15	13	Moderately exploited
Cephalopods	France, Norway, Portugal, Spain	1000*	11	36	25	29	37	42	48	Vitually unexploited
Other molluscs	F.R. Germany, France, Spain		28	39	31	27	33	25	32	
Total molluscs			**386**	**507**	**513**	**594**	**598**	**642**	**667**	
Total area a/			**9590**	**10879**	**12230**	**11799**	**11646**	**10762**	**11131**	

Note Management measures. The management regime of this region is in a period of transition, with the establishment of entailed jurisdiction by the coastal state, and the slow development of a common fishery policy by the EEC. A variety of measures, principally catch quotas, and controls on mesh sizes and sizes of fish have been set.

* Aquaculture important

a/ Including grooved sea squirt, starfish and purple sea urchin

Table 5

Western Central Atlantic (Area 31)

Stock	Estimated potential ('000 t)	Main fishing countries (1983)	Catches ('000 t) 1965	1970-74	1975-79	1980	1981	1982	1983	State of Exploitation
Freshwater and diadromous fishes	500	Venezuela	8	10	7	8	7	8	13	Fully exploited
Snappers	about 100	Cuba, Brazil	19	21	19	19	21	21	24	Uneven, some stocks
Groupers		Mexico, USA, Venezuela	18	24	21	29	31	30	31	Fully exploited
Grunts	a few 100	Guyana	5	29	23	7	11	6	7	(including shrimp bycatch)
Sciaenids		USA, Venezuela	21	35	38	36	33	30	24	
Mullets	unknown	Mexico, USA	28	27	23	35	32	30	28	Uncertain b/
Sharks and rays	50-100	Mexico, Venezuela	9	8	12	14	20	20	22	Moderately exploited
Other demersal fishes	unknown	Mexico, Venezuela	74	38	38	45	62	70	71	(including shrimp bycatch)
Atlantic menhaden	500	USA	87	50	80	99	140	89	84	Fully exploited
Gulf menhaden	500	USA	464	571	636	702	553	854	924	Fully exploited
Sardinella	some 100s	Venezuela	44	44	40	59	33	58	46	Moderatley exploited
Other clupeoids	unknown	Cuba, Venezuela	12	20	15	13	10	11	12	Moderately exploited
King and Spanish mackerels	30-50	Mexico, USA, Venezuela	15	21	22	24	23	26	26	Moderately to fully exploited
Tunas	a/	Cuba, Venezuela	29	27	35	35	42	48	70	Larger species moderately exploited
Other pelagic fish	200-400	Barbados, Venezuela	61	21	25	22	27	25	31	Moderately exploited
Unidentified fishes		Mexico, USA	67	130	139	186	228	218	239	
Total fish			**961**	**1076**	**1173**	**1333**	**1273**	**1544**	**1652**	
Crabs	50-150	Mexico, USA	40	34	39	44	47	49	49	Moderately exploited
Spiny lobsters	40	Cuba	15	20	22	23	22	22	24	Most stocks fully
Shrimps	210	Mexico, USA	139	170	165	178	188	166	160	or over-exploited
Total crustaceans			**194**	**224**	**226**	**245**	**257**	**237**	**233**	
Oysters	-	Mexico, USA	196	162	172	176	177	211	246	Large potential for culture
Cephalopods	100-1000	Mexico, Venezuela	1	5	7	8	9	9	11	Virtually unexploited
Calico scallop		USA, Venezuela	-	9	14	0	147	111	97	Moderately-fully exploited
Other molluscs			3	17	33	30	38	39	26	
Total molluscs	**300-1200**		**200**	**193**	**226**	**214**	**371**	**370**	**380**	
Others			-	2	1	3	1	4	3	
Total area			**1355**	**1495**	**1626**	**1795**	**1902**	**2155**	**2268**	

Source: Yearbooks of Fishery Statistics

a/ See Table 19
b/ Probably moderately to heavily fished if the discards by shrimp trawlers are taken into account

Table 6

Eastern Central Atlantic (CECAF - Area 34)

CECAF Sub-areas	Stock	Main fishing countries	Estimated potential ('000 t)	Catches ('000 t) a/ 1970 -74	1975 -79	1980	1981	1982	e/	State of exploitation
Total North				**2334**	**2324**	**2194**	**2023**	**1527**		
NORTH										
All sub-areas	Cephalopods			173	147	94	136	72		Overexploited
34.1.1, 34.1.3	Octopus	Japan, Spain, USSR	100-135	95	79	53	83	33		Grossly overexploited
34.1.3, 34.3.1	Cuttlefish	Japan, Senegal, Spain	30-40	31	26	22	22	15		Overexploited
34.1.1, 34.1.3	Squid	Korea Rep., Spain	20-40	23	15	11	12	10		Overexploited
34.1.1, 34.1.3	European sardine	Morocco, Spain, USSR	1000 (variable)	392	630	495	521	337		Possibly fully exploited
34.1.3, 34.3.1	Sardinellas	Bermuda, Poland, Senegal, USSR	600 (variable)	169	204	212	125	138		Intensively exploited, locally overfished
34.3.1	Bonga	Gambia, Senegal	?	27	27	17	22	10		Unknown
34.1.3, 34.3.1	Horse mackerels	Germany, D.R., Romania, Senegal, USSR	400 (variable)	301	324	415	342	310		Possibly fully exploited (decreasing recruitment)
34.1.3, 34.3.1	Mackerels	Romania, USSR	100	87	82	69	91	92		Overexploited
34.1.3, 34.3.1	Hakes	Spain, USSR	?	41	39	29	16	9		Assessments unreliable large variability
34.1.1	Hakes	Morocco, Spain	6-12	10	10	9	6	2		Grossly overexploited
34.1.3, 34.3.1	Sea breams	Greece, Senegal, USSR	150(?)	91	60	22	28	37		Probably overexploited

Table 6 (continued)

CECAF Sub-areas	Stock	Main fishing countries	Estimated potential ('000 t)	Catches ('000 t) a/ 1970 -74	1975 -79	1980	1981	1982	e/	State of exploitation
Total South				**540**	**655**	**725**	**778**	**783**		
SOUTH										
34.3.3/34.3.4/ 34.3.5/34.3.6	All prawn and shrimp	Cameroon, Ivory Coast, Nigeria, Spain	15	4	6	10	7	7		Close to full exploitation
All sub-areas	Demersal c/		68-85	158	208	256	260	240		Fully exploited
34.3.4	Sardinellas	Ghana, Ivory Coast	60 (variable)	57	53	44	39	44		Round sardinella recovering; fully exploited
34.3.6	Sardinellas	Congo, Zaire	Unknown	6	6	6	10	12		Probably moderately exploited
All sub-areas	Bonga	Gabon, Ivory Coast, Sierra Leone	Unknown	44	40	64	69	71		Intensively exploited; stock collapse in Ivory Coast
Total Oceanic				**56**	**63**	**139**	**33**	**21**		
OCEANIC										
34.1.2/34.2.0/ 34.3.2/34.4.1/ 34.4.2										
TUNA 34.0 b/		France, Japan, Korea, Spain, USA		200	249	281	300	305		Moderately to heavily exploited
UNKNOWN AREA 34.9.0					471	99	82	369		
Total CECAF area a/					**3132**	**3385**	**3439**	**3216**	**3192**	

a/ Source: CECAF Statistical Bulletins; 1983 data not available, regional total from Yearbook of Fishery Statistics
b/ Catches in all sub-areas; see also Table 19
c/ Probably over-estimated, due to Nigerian reporting
d/ At present possibly lower in the long run
e/ Data for 1983 not yet available

Table 7

Mediterranean and Black Sea (Area 37)

Sector a/	Species Groups	Coastal countries	Estimated stocks	Potentials ('000 t) b/	Catches ('000 t) c/ 1965 -69	1970 -74	1975 -79	1980	1981	1982	1983 e/	
Balearic 37.1	Demersal	Algeria	Trawl only	80	28.4	32.4	37.0	46.7	38.2	42.5		Demersal stocks
	Coastal pel.	Morocco		Unknown	...	93.2	132.4	133.6	152.7	163.3		
	Miscel. d/	Spain			...	10.3	22.6	22.7	38.6	34.9		Fully exploited to grossly overfished in the Northern Mediterranean coasts. Moderately to fully exploited on the Southern Mediterranean shores.
Gulf Lions 37.2	Demersal		Finfish (shelf)	10	9.7	9.1	7.2	8.0	8.7	10.0		
	Coastal pel.	France	Sardine	20-25	19.7	19.7	18.5	22.4	29.9	29.3		
	Miscel. d/				7.7	9.4	3.3	1.6	1.9	1.8		
Sardinia 37.3	Demersal	France	Trawl only	60	52.4	43.6	22.8	19.2	22.1	22.3		
	Coastal pel.	Italy (W)		100	48.5	58.8	39.1	28.5	43.2	35.9		
	Miscel. d/	Tunisia (N)			37.7	15.1	12.4	12.5	11.9	11.7		
Adriatic 37.4	Demersal	Italy (E)	Trawl only	80-100	50.6	32.6	18.4	18.0	15.8	27.1		
	Coastal pel.	Yugoslavia		few 100s	47.4	80.2	91.7	121.6	138.6	124.5		Coastal pelagic stocks
	Miscel. d/				34.3	30.6	37.2	27.3	29.5	20.8		
Ionian 37.5	Demersal	Albania, Greece (W)	Trawl only	85	38.2	37.8	42.2	38.4	39.8	30.1		Moderately exploited except few sectors fully exploited. Changes in species composition in area 37.1. Changes in biomass in the Adriatic.
	Coastal pel.	Italy (S), Libya		Unknown	16.3	32.2	43.8	50.0	46.0	54.2		
	Miscel. d/	Malta, Tunisia(E)			28.0	16.3	35.2	35.1	38.4	56.8		
Aegean 37.6	Demersal			Unknown	19.9	17.5	22.2	26.2	25.1	27.6		
	Coastal pel.	Greece (E)		Unknown	18.7	23.2	35.8	46.1	43.3	43.8		
	Miscel. d/	Turkey (W)			11.5	7.5	10.2	12.9	12.3	14.4		
Levant 37.7	Demersal	Cyprus, Egypt	Finfish	25(?)	10.0	10.0	12.0	13.0	15.3	11.5		
	Coastal pel.	Israel, Lebanon		Unknown	3.7	9.1	9.0	12.0	14.7	12.4		
	Miscel. d/	Syria, Turkey			10.5	4.1	3.1	4.9	5.2	3.3		
Whole Mediterranean	Demersal			400-500	199.2	183.0	161.8	169.5	165.0	171.1		
	Coastal pel.			500(?)	320.9	316.4	370.3	414.2	468.4	463.4		
	Miscel. d/				89.0	93.3	124.0	117.0	137.8	143.7		
Total Mediterranean				**1000**	**609.1**	**592.7**	**656.1**	**700.7**	**771.2**	**778.2**		
Black Sea 37.8	Demersal	Bulgaria, Romania		few 100s	59.2	27.7	31.8	36.3	32.4	44.5		Demersal stocks
	Coastal pel.	Turkey		500	179.0	335.0	369.3	639.0	637.0	690.9		
	Miscel. d/	USSR			86.0	57.6	73.5	85.4	60.2	140.9		Fully or over- (turbot) exploited
Area 37.0	Tunas				...	22.9	25.9	37.7	44.5	50.9		Pelagic stocks
Totals Area 37	Demersal				258.4	210.7	193.6	205.8	197.4	215.6		
	Coastal pel.				499.9	651.4	739.6	1053.2	1105.4	1154.3		Probably moderately to fully exploited
	Miscel.				175.0	150.9	197.5	202.4	198.0	284.6		
	Tunas				...	22.9	25.9	37.7	44.5	50.9		
Total area c/				**1500**	**933.3**	**1115.1**	**1292.7**	**1647.1**	**1698.3**	**1872.2**	**1898.0**	

a/ GFCM statistical divisions (boundaries given in GFCM Statistical Bulletins

b/ Potenial and catch figures do not generally correspond accurately: for instance, part of demersal catches are reported under miscellaneous; potentials may refer to stocks exploited by trawl only, whereas demersal landings include catches by all gear, etc. For this reason, for most areas, the catches reported for demersal are much lower than the potential estimate although most stocks are fully or overexploited.
Sources for potential estimates: Reports of the 6th and 7th Sessions of the GFCM Working Party on Resources Evaluation and Fishery Statistics.

c/ Source for catch statistics by sectors: GFCM Statistical Bulletin No.5, FAO - 1984; Figures for period 1965-69 have not been revised.

d/ Miscellaneous: diadromous plus marine fisheries n.e.i.

e/ 1983 - Catch statistics by sectors not available. Source: Yearbook of Fishery Statistics, Vol.54.

Table 8

Southwest Atlantic (Area 41)

Stock	Principal countries	Estimated potential ('000 t)	Catches ('000 t) 1965	1971 -74	1975 -79	1980	1981	1982	1983	State of exploitation
Argentine hake	Argentina, Brazil, Uruguay	600	105	153	316	355	327	360	345	Moderately exploited
Southern blue whiting	Poland, USSR		0	0	11	78	70	137	258	Probably heavily to fully exploited
Atlantic croaker	Argentina, Brazil, Uruguay	-	a/	56	84	80	79	83	83	Moderately to fully exploited
Weakfishes	Argentina, Brazil, Uruguay	-	a/	42	58	70	81	80	67	Moderately to fully exploited
Sardinella	Brazil	200	50	164	165	229	177	197	240	Fully exploited
Anchoita	Argentina, Uruguay	1000	17	32	20	11	15	10	28	Virtually unexploited
Red shrimp	Argentina	expanding		0	0	1	3	8	19	Moderately to fully exploited
Other prawns and shrimps	Brazil	60	40	50	54	48	46	53	53	Most stocks fully to heavily exploited
Squids	Argentina, Brazil, Japan, Poland, Uruguay	few 100s	1	4	43	31	54	208	203	Some stocks probably fully exploited
Sprats	Argentina	few 100s	-	-	-	-	-	-	-	Unexploited
Other demersal Patagonion Shelf	Argentina, Germany, Japan, Poland, UK, USSR	500-1000	1	0	5	14	4	5	4	Very lightly exploited
Total			**520**	**846**	**1092**	**1273**	**1254**	**1516**	**1658**	

a/ Detailed statistics not available

Table 9

Southeast Atlantic (Area 47)

Stocks: Species	Stocks: ICSEAF divisions	Major fishing countries (1983)	Estimated potential ('000 t)	Catches ('000 t) a/b/: 1965-69	1970-74	1975-79	1980	1981	1982	1983	State of exploitation
Hakes	1.1+1.2	USSR	10(?)	0	3	11	3	5	2	0	Probably moderate
	1.3+1.4	Spain, USSR	340	241	414	284	103	101	194	222	Recently overexploited
	1.5	Spain, Sth. Africa, Portugal	210	175	231	158	70	116	128	123	Recently overexploited possibly some recovery
	1.6	Sth. Africa	160	140	164	104	102	97	83	74	Recently overexploited
	2.1+2.2	Sth. Africa	65	22	55	53	48	35	47	41	Biomass coming back to the level of maximum average yield
Kingklip	Mainly 1.4+1.5+1.6 +2.1+2.2	Sth. Africa, Spain	20(?)	4	12	12	11	10	7	9	Slightly overexploited
Large-eyed dentex	1.2+1.3+1.4	Bulgaria, Romania	Few 10s(?)	40	15	26	0	0	0	1	Fully exploited
Panga	2.1+2.2	Japan, Sth. Africa	8	11	8	6	2	2	2	2	Fully exploited
Sardinella	1.1+1.2+1.3	Angola, USSR	Few 100s(?)	75	92	125	205	160	181	154	Moderately exploited
Cunene	1.1+1.2	Angola, USSR	500* or more with recent high recruitments	...	...	30	51	47	47	58	Intensively exploited
Horse mackerel	1.3+1.4+1.5	Angola, USSR		142	159	180	297	95	58	52	
Cape horse mackerel	1.3+1.4+1.5	Bulgaria, Poland, Romania, Sth. Africa, USSR		80	161	386	283	564	647	536	
	1.6+2.1+2.2	Japan, Sth. Africa	Varying, 100(?)	32	32	52	17	17	16	38	Moderately to highly exploited

Table 9 (continued)

Species	Stocks: ICSEAF divisions	Major fishing countries (1983)	Estimated potential ('000 t)	Catches ('000 t) a/b/: 1965-69	1970-74	1975-79	1980	1981	1982	1983	State of exploitation
Pilchard	1.3+1.4+1.5	Poland, USSR	About 600 before collapse sustainable yield few 100s at present	960	462	280	12	53	54	50	Severely depleted Sharp decrease in biomass
	1.6	Sth. Africa	Varying* around 100	111	68	91	50	46	35	61	Depleted
Anchovy	1.3+1.4+1.5	Sth. Africa	at least 250	91	211	212	190	199	83	184	Fully exploited
	1.6	Sth. Africa	150-350	175	233	244	315	292	306	240	Fully exploited
Chub mackerel	1.1+1.2+ 1.3+1.4	Spain, USSR	Unknown	0	3	78	12	48	34	50	Probably intensively exploited
	1.6	Sth. Africa	Varying* around 50(?)	81	58	23	2	3	4	5	Fully exploited or depleted
Total area b/				**2706**	**2751**	**2751**	**2137**	**2350**	**2294**	**2302**	

Source: 1965-76 information provided in FAO Fish. Circ. 710 updated on the basis of reports of December 1979 ICSEAF meeting
* Recruitment and consequently biomass and potential have considerably fluctuated since the outset of the fishery

a/ 1977-79 data: ICSEAF Bulletins
b/ Total production figures for the whole area: 1965-79 FAO Yearbook of Fishery Statistics Vol. 48: 1980-83 ICSEAF Bulletins
c/ 1983, preliminary data

*

Table 10

Western Indian Ocean (Area 51)

Stock	Main fishing countries	Catches ('000 t) 1980	1981	1982	1983	State of exploitation
Shad (Hilsa)	India, Pakistan	12	10	12	12	
Giant sea perch	Pakistan	1	2	3	3	
Flat fishes	India	12	11	16	18	
Bombay duck	India	115	97	75	81	
Sea catfishes	India, Pakistan, USSR	61	54	47	48	
Lizard fishes	India, Egypt	11	10	8	9	
Pike congers	India, Pakistan	18	13	11	12	
Unsorted bass-like species	Yemen Dem. Oman, Sri Lanka, India	198	192	199	228	Demersal stocks
Groupers	Italy ('80), Mauritius, UAE	4	8	12	13	Mostly moderately to fairly heavily exploited
False trevally	India	4	4	8	9	
Snappers	Pakistan, island states	3	4	5	5	
Ponyfishes	India	9	6	14	16	
Grunts	Pakistan, Gulfs	2	5	6	6	
Emperors (Lethrinids)	Tanzania, Mauritius, UAE	10	13	13	22	
Croakers, drums	India, Pakistan	114	112	107	114	
Goatfishes	India	6	5	7	7	
Porgies, seabreams	Korea, USSR, Pakistan	8	10	13	13	
Threadfins	India, Pakistan	3	4	5	6	
Black pomfret	Pakistan	3	3	4	4	
Butter fishes	India	39	35	29	31	
Carangids	Pakistan, Sri Lanka, India, UAE, USSR	43	48	54	47	
Sardinellas	India, Pakistan, UAE, Yemen, Dem.	227	346	272	290	Stocks of small pelagic fish
Anchovies	India, UAE	40	37	49	51	Lightly to moderately exploited
Wolfherrings	India, Pakistan	19	18	18	19	
Mixed clupeoids	Sri Lanka, India	75	85	89	92	
Hairtails	India, Pakistan	42	36	45	47	
Mackerel (Rastrelliger)	India, Sri Lanka, USSR, UAE	67	73	50	51	
Sharks, rays	India, Pakistan, Sri Lanka	113	115	118	122	
Kingfish or seerfish	India, Pakistan, Sri Lanka	35	35	40	45	
Skipjack	Maldives, Sri Lanka, France (1983)	37	36	36	49	
Yellowfin	Sri Lanka, Maldives, Japan, Korea	22	29	38	46	
Longtail tuna	Iran, UAE	1	2	7	3	
Little tuna	Pakistan	8	12	12	10	
Tuna-like fishes	India, Sri Lanka	29	25	28	30	
Big-eye	Korea, Japan	16	22	28	25	
Albacore	Not identified	7	6	4	5	
Southern bluefin	Japan	2	5	4	4	
Marlins	Japan, Korea, Not ident. Pakistan	5	6	6	6	
Other identified fish		65	36	62	75	
Unidentified fish		319	228	221	242	
Total fish		**1778**	**1798**	**1775**	**1915**	

Table 10 (continued)

Stock	Main fishing countries	Catches ('000 t) 1980	1981	1982	1983	State of exploitation
Penaeid shrimp	India, Pakistan, Mozambique, Madagascar, Gulf States	259	186	210	225	Mostly fully exploited or overfished
Lobsters	Somalia, Pakistan, Reunion	3	2	2	2	
Mixed crustaceans	India, Saudi Arabia, Sri Lanka	25	22	26	27	
Total crustaceans		**287**	**210**	**238**	**254**	
Cuttle fish	YAR, Japan, USSR	16	4	3	2	
Other cephalopods and bivalves	India, Japan, Italy	13	10	11	13	
Total molluscs		**29**	**14**	**14**	**15**	
Total area		**2098**	**2025**	**2031**	**2186**	

Table 11

Eastern Indian Ocean (Area 57)

Species group	Main fishing countries	Catches ('000 t) 1980	1981	1982	1983
Shad (Hilsa)	India (Bangladesh, Burma not included)	18	14	17	18
Giant seaperch	Indonesia, Australia	3	1	1	1
Flatfishes	India, Thailand	3	4	3	3
Sea catfishes	India	25	24	23	24
Lizard fish	India	4	5	5	5
False trevally	India	4	4	4	4
Sillago	Australia	2	2	3	3
Ruffs	Australia	3	3	4	4
Snappers	Indonesia	3	3	2	2
Threadfin breams	Thailand, Indonesia	5	5	4	3
Ponyfishes	India, Indonesia	36	36	42	46
Croakers	India, Thailand	34	24	30	32
Goatfishes	India, Indonesia	3	3	4	5
Halfbeaks and needlefish	India, Australia, Indonesia	8	7	8	9
Barracudas	India, Thailand	4	5	5	6
Threadfins	India	4	5	5	5
Carangids	India, Indonesia, Thailand	27	32	37	40
Butterfishes	India	14	11	11	12
Sardinella, sardines	India, Indonesia	76	71	93	100
Anchovies	India, Indonesia	47	50	48	52
Other Clupeoids	India, Australia	11	16	13	14
Wolfherrings	India, Thailand	9	10	7	7
Kingfish, seerfishes	India, Indonesia, Thailand	19	18	20	22
Hairtails	India, Indonesia	23	36	38	41
Mackerels (Rastrelliger)	India, Indonesia, Thailand	34	31	40	42
Sharks and rays	India, Indonesia, Australia	42	47	50	53
Skipjack	Indonesia	8	7	12	15
Yellowfin	Indonesia, Japan	13	9	7	8
Bigeye	Japan, Korea Rep., not identified	16	11	8	8
Albacore	Not identified	6	6	5	5
Southern bluefin	Australia, Japan	19	18	21	20
Marlins, etc.	Japan, Korea Rep., not identified	4	4	2	2

Table 11 (continued)

Species group	Main fishing countries	Catches ('000 t) 1980	1981	1982	1983
Tuna-like fish	Indonesia, India, Thailand	28	24	38	44
Other, identified fish	Australia, Indonesia, Thailand, India	38	39	43	45
Unidentified fish	Bangladesh, Burma, Thailand, India	736	796	792	797
Total fishes		**1329**	**1381**	**1445**	**1497**
Swim and mud crabs	Thailand	8	8	6	5
Lobsters	Australia	14	16	15	22
Penaeid shrimps	India, Thailand,	11	15	15	15
Sergestid shrimps	Australia, Indonesia	3	3	3	3
Other crustacea	India	55	48	54	58
Total crustaceans		**91**	**90**	**93**	**103**
Abalones	Australia	6	6	6	6
Oysters and mussels	Australia, Thailand	2	3	5	5
Scallops	Australia	6	6	20	23
Cockles and clams	Thailand	8	2	3	3
Cuttlefish and squids	Thailand	14	9	9	10
Other mulluscs	India, Thailand	1	4	3	3
Total molluscs		**37**	**30**	**46**	**50**
Jelly fishes	Thailand	0	19	74	125
Total area		**1458**	**1522**	**1659**	**1774**

Source: FAO Yearbooks of Fisheries Statistics

Table 12

Northwest Pacific (Area 61)

Stock	Main fishing countries (1983)	Estimated potential a/ ('000 t)	Catches ('000 t) 1965	1970-74	1975-79	1980	1981	1982	1983	State of exploitation
Salmon	Japan, USSR	300-350	236	186	230	222	251	197	266	Somewhat depleted but recovering
Alaska pollack	Japan, Korea Rep. USSR	3000-5000	826	3014	3564	3193	3131	3484	3767	Fully exploited
Largehead hairtail	China, Korea Rep.	650-700	...	673	571	657	703	676	666	Fully exploited
Other demersal	China, Japan, Korea Rep., USSR	2800-2900	1101	1683	2068	1945	1850	1813	1676	Most stocks fully exploited or overfished
Pacific saury	Japan	5800-6500	306	283	334	238	203	241	226	Stocks fished close to maximum, taking into account fishing and natural fluctuations, by strong management measures
Japanese jack mackerel	Japan		553	192	116	57	72	120	124	
Pacific herring	China, Japan, USSR		370	465	248	129	131	137	180	
Japanese sardine	Japan, Korea Rep., USSR		9	157	1433	2595	3613	3966	4220	
Japanese anchovy	Japan, Korea Rep.		473	441	356	320	345	360	336	
Chub mackerel	China[c/], Japan, Korea Rep., USSR		694	1554	1808	1679	1358	1177	1158	
Tunas, billfishes[b/]	Japan	280-380	...	285	315	354	263	291	302	Most stocks fully exploited
Other pelagic	Japan		...	387	490	526	498	515	531	
Japanese flying squid	Japan, Korea Rep.	300-400	397	425	285	379	259	248	227	Fully exploited
Marine fishes n.e.i.	China, Japan, Korea Rep.	3800-3900[d/]	...	2818	3488	3636	3947	4072	4176	
Total area		**19800-21600[e/]**	**10687**	**12546**	**17951**	**18759**	**19482**	**20403**	**21137**	Nearly fully exploited

a/ Generally on a conservative basis
b/ Includes skipjack tuna, larger tunas, smaller tunas and billfishes
c/ Taiwan, Province of China
d/ Current level
e/ Includes, in addition to the above (1) other cephalopods (650-850); (2) prawn and shrimps (400-600), and (3) others (1750-current level)

Table 13

Northeast Pacific (Area 67)

Stock	Main fishing countries (1983)	Estimated potential ('000 t)	Catches ('000 t) 1965	1970 -74	1975 -79	1980	1981	1982	1983	State of exploitation
Salmons	Canada, USA	250	188	197	219	330	371	339	360	Fully exploited
Halibut	Canada, USA	38	39	25	14	13	15	17	24	Depleted, recovering
Yellowfin sole	Japan, USA	150-180	...	56	76	60	77	81	88	Moderately exploited
Other flatfishes	Japan, Korea Rep., USA	210-350	88	172	112	107	126	113	117	Moderately exploited
Pacific cod	Canada, Japan, Korea Rep., USA	350-380	33	70	62	77	102	99	120	Moderately exploited
Alaska pollack	Japan, Korea Rep., USA	1150-1600	216	1063	888	827	1046	994	1280	Fully exploited
North Pacific hake	Bulgaria, Japan, Poland, USA	210	1	169	163	57	120	94	96	Moderately exploited
Pacific ocean perch	Canada, Japan, USA	210	455	109	41	31	29	23	26	Depleted
Sable fish	Japan, USA	50-60	11	47	28	18	22	28	26	Moderately exploited
Pacific herring	Canada, USA	several 100s	229	114	101	66	81	77	89	Local stocks in different states
King crabs	USA	30-50	62	40	53	84	40	17	12	Depleted
Pacific snow crabs	USA	50-80	-	31	52	62	50	31	28	Fully exploited
Pacific ocean shrimps	USA	Unknown	10	58	67	44	30	20	9	Fully to heavily exploited
Total area			**1460**	**2392**	**2058**	**1975**	**2373**	**2160**	**2492**	

Table 14

Central Pacific (Area 71)

Stock	Main fishing countries (1983)	Catches ('000 t) 1970-74	1975-79	1980	1981	1982	1983	State of exploitation
Demersal fish	Major Asian countries c/	491	622	639	623	641	673	Inshore stocks heavily exploited
Major coastal pelagic species								
Round scads	Major Asian countries c/	264	345	245	274	311	303	Scads and mackerels approaching maximum, sardines, anchovies moderately exploited
Mackerels		223	237	274	295	300	345	
Sardines		231	411	418	477	444	467	
Anchovies		148	174	216	214	225	223	
Total		**866**	**1167**	**1153**	**1620**	**1280**	**1338**	
Skipjack tuna	Indonesia and Philippines	42	70	75	85	101	116	Approaching maximum level
	Major Oceanic countries d/	32	55	65	61	33	41	
	Non-coastal countries e/	103	156	163	154	177	181	
Total		**177**	**281**	**303**	**300**	**311**	**338**	
Yellowfin tuna	Indonesia and Philippines	48	62	66	78	76	83	(see tuna review)
	Major Oceanic countries d/	3	7	6	9	7	7	
	Non-coastal countries f/	30	57	87	94	90	92	
Total		**81**	**126**	**159**	**181**	**173**	**182**	
Smaller tunas a/	Major Asian countries c/	62	92	134	135	130	127	Moderately exploited
Penaeid prawns/shrimps all shrimps and prawns	Major Asian countries c/, Australia, Papua New Guinea	179	206	232	236	239	250	Most stocks fully or heavily exploited
Total		**278**	**365**	**398**	**456**	**439**	**438**	
Cephalopods b/	Major Asian countries	95	136	132	140	165	180	Only slightly to moderately exploited
Total area		**4718**	**5651**	**5487**	**5761**	**5841**	**6151**	

a/ Ballet and frigate tunas, kawakawa and longtail tuna. Nominal statistics are incomplete, only a few countries separated these species
b/ Cuttlefishes, squids and octopuses
c/ Indonesia, Malaysia, Philippines and Thailand
d/ Australia, Fiji, Kiribati and Solomon Islands
e/ Japan, Korea Rep. and USA
f/ Japan, Korea Rep. USA and Tawain, Province of China

Table 15

Eastern Central Pacific (Area 77)

Stock	Main fishing countries (1983)	Estimated potential ('000 t)	Catches ('000 t) 1965	1970 -74	1975 -79	1980	1981	1982	1983	State of exploitation
Demersal fishes	Mexico, USA	1000-2000	33	81	70	79	122	123	98	Lightly exploited
Chub mackerel	Ecuador, Mexico, USA	few 100s		68	366	605	701	282	134	Moderately exploited
Pacific jack mackerel	USA	100-500	30	19	27	20	15	26	19	Lightly exploited
Californian pilchard (=sardine)	Mexico	a/	21	58	143	328	344	433	316	a/
North Pacific anchovy	Mexico	500-1000	3	92	238	374	424	365	237	Lightly exploited
Central Pacific anchoveta	Colombia, Ecuador	few 100s	42	38	107	172	110	77	160	Moderately to fully exploited
Pacific thread herring	Ecuador, Panama	few 100s	7	17	19	23	27	60	40	Moderately to fully exploited
Other coastal pelagic fishes	Ecuador, Mexico, USA	500?	20	8	12	20	30	212	112	Lightly exploited
Skipjack tuna	Mexico, USA	250	76	61	121	134	147	122	79	Moderately exploited
Northern bluefin tuna	Mexico, USA		8	9	8	3	2	3	1	Moderately exploited
Albacore	Japan, USA, Other nei	100-200	19	15	20	18	22	23	25	Moderately exploited
Bigeye tuna	Japan	b/	36	42	69	68	55	63	65	Moderately exploited
Yellowfin tuna	Mexico, USA	200-250	97	165	197	152	167	137	116	Fully exploited
Other oceanic fish	Ecuador, Japan, USA	100-500?	31	28	42	40	46	48	39	Lightly exploited
Unident. fishes	Ecuador, Mexico		69	153	125	200	302	174	47	
Total fishes c/			**495**	**868**	**1567**	**2247**	**2524**	**2153**	**1493**	
Dungeness and Pacific rock crabs	USA	500?	0	2	1	0	1	0	0	Unexploited
Shrimps	Ecuador, Mexico, Panama	80	61	78	71	88	92	113	103	Fully exploited
Total crustaceans		**600**	**65**	**84**	**83**	**103**	**115**	**127**	**110**	
Squids	Mexico, USA	500-100?	9	11	14	31	32	20	5	Lightly exploited
Total molluscs			**23**	**31**	**36**	**64**	**67**	**51**	**30**	
Others			2	6	13	3	3	11	9	
Total area			**585**	**989**	**1699**	**2417**	**2709**	**2342**	**1642**	

a/ Potential varies - USA fishery collapsed in the 1950s
b/ See also Table 19
c/ Includes freshwater fishes

Table 16

Southwest Pacific (Area 81)

Stock	Main fishing countries (1983)	Estimated potential ('000 t)	Catches ('000 t) a/ 1965	1970-74	1975-79	1980	1981	1982	1983	State of exploitation
Demersal	Japan, New Zealand, USSR	appr. 500	48	85	156	149	169	167	197	Moderately to heavily exploited in some areas
Poutassou	USSR	Not available	-	23	19	8	7	18	20	Unknown
Grenadier	USSR		-	2	48	13	14	16	25	
Small pelagic	Australia, Japan, New Zealand	appr. 1000	11	26	38	22	28	32	37	Probably mostly to moderately exploited
Jack mackerels	Japan, New Zealand	Not available	-	14	13	6	12	10	10	Unknown
Rock lobsters	New Zealand	6	5	5	4	5	5	5	5	Fully exploited
Oysters	Australia, New Zealand	b/	-	19	20	17	18	21	22	Probably fully exploited
Cephalopods	Japan, USSR	Not available	-	8	35	80	63	71	76	Lightly exploited
Total area			**120**	**254**	**374**	**382**	**396**	**400**	**432**	

a/ Main Australian fishery in Tasmania/South Australia now considered under Indian Ocean
b/ Potential harvest dependent on intensity of aquaculture

Table 17

Southeast Pacific (Area 87)

Stock	Main fishing countries (1983)	Estimated potential ('000 t)	Catches ('000 t) 1965	1970-74	1975-79	1980	1981	1982	1983	State of exploitation
Chilean hake	Chile, Peru	100-200	106	139	194	191	103	50	30	Fully exploited
Chilean jack mackerel	Chile, Peru, USSR	over 2000(?)	15	173	776	1280	1740	2200	1643	Moderately exploited
Chilean pilchard (=sardine)	Chile, Peru	3000(?)	50	103	1512	3253	2804	3272	3888	Fully exploited
Anchoveta (=Peruvian anchovy)	Chile, Peru	Unknown[a/]	7680	6959	2251	823	1550	1826	1261	Depleted
Squids	Chile, Peru	Some 100s	0.4	0.6	0.5	0.3	1.1	3.8	4.2	Virtually unexploited
Sauries	Chile, Peru	Some 100s	-	-	-	-	-	-	-	Unexploited
Total area			**8270**	**7939**	**5314**	**6228**	**6835**	**7874**	**6191**	

a/ Potential used to be 9 000-11 000 tons under conditions occurring in the 1960s

Table 18

Southern Oceans (Areas 48, 58 and 88)

Stock	Main fishing countries (1983)	Estimated potential ('000t)	Catches ('000 t) 1969/70 -73/74	1974/75 -78/79	1979 -80	1980 -81	1981 -82	1982 -83	State of exploitation
Marbles Notothenia									
Area 48 a/	Germany, D.R.	Unknown	83	7	45	2	1	1	Probably
Area 58 b/	USSR		47	19	2	8	10	2	heavily exploited
Antarctic icefish									
Area 48 a/	Poland, USSR	Unknown	3	67	14	33	47	137	Probably
Area 58 b/	USSR	10 c/	24	29	2	1	16	26	heavily exploited
Other fishes									
Area 48 a/	Poland, USSR	Unknown	1	31	37	67	44	29	
Area 58 b/	USSR	Unknown	25	13	16	10	6	2	
Area 88	USSR		0	0	-	2	0	-	
Total fishes									
Area 48			**87**	**105**	**96**	**102**	**92**	**167**	
Area 58			**96**	**42**	**20**	**19**	**32**	**30**	
Area 88			**0**	**0**	**-**	**2**	**0**	**-**	
Krill									
Area 48	USSR		4	98	357	289	374	135	
Area 58	Japan, USSR	50 million?	0	26	118	155	148	80	
Area 88	USSR		0	1	3	4	7	11	
Total area									
Area 48			**91**	**205**	**453**	**391**	**466**	**302**	
Area 58			**96**	**69**	**138**	**174**	**180**	**110**	
Area 88			**0**	**1**	**3**	**6**	**7**	**11**	
Total Southern Oceans			**187**	**275**	**594**	**571**	**653**	**423**	

a/ Principally around South Georgia
b/ Principally around Kerguelen
c/ Preliminary estimate for Kerguelen EEZ

Table 19

Oceanic tunas and billfishes

Ocean	Species	Main fishing countries (1983)	Estimated potential ('000 t)	Catches ('000 t) a/ 1965 -69	1970 -74	1975 -79	1980	1981	1982	1983	State of exploitation
Atlantic	N. Bluefin	Italy, France, Japan, Spain, USA	20-30 b/	22	16	23	19	19	23	15	Heavy
	Albacore	Taiwan (P.China), Spain, Other	70-90	77	76	71	61	59	72	65	Heavy
	Yellowfin	Spain, France, Venezuela	120-160	73	88	127	120	144	145	132	Heavy
	Bigeye	Japan, Korea Rep., Portugal	50-100?	29	45	45	59	58	66	40	Moderate
	Skipjack	Spain, France, Ghana, Brazil, Venezuela	200-300?	30	83	91	116	140	166	137	Moderate
	Billfishes including Swordfishes	Spain, USA, Japan, Cuba, etc.	20-50?	23	18	21	26	21	27	22	Probably heavy (i.e., blue and striped marlin)
						378	**401**	**441**	**499**	**411**	
Indian	S. Bluefin e/	Japan, Australia	35-40	59	59	36	35	35	34	34	Heavy
	Albacore	Taiwan (P.China), Korea Rep., Japan	15-20 c/d/	17	17	12	10	9	21	21	c/
	Yellowfin	Korea Rep., Maldives, Sri Lanka, France	100-150	40	36	40	35	36	47	54	Moderate
	Bigeye	Korea Rep., Taiwan (P.China), Japan	30-60?	25	20	36	32	32	41	33	Moderate
	Skipjack	Maldives, Sri Lanka, Indonesia	200-400	16	39	33	46	46	48	64	Ligthly
	Billfishes	Korea Rep., Japan, Taiwan (P.China)	10?	14	7	6	10	9	11	6	Moderate
						163	**109**	**168**	**190**	**212**	
Pacific	N. Bluefin	Japan, USA	d/	30	20	19	17	29	27	-	Fully
	Albacore	Japan, USA, Mexico	d/	90	130	122	108	110	101	-	Probably near fully
	Yellowfin	USA, Japan, Philippines, Mexico	d/	164	291	365	372	378	367	-	Fully in East
	Bigeye	Japan, Korea Rep., Taiwan (P.China)	120-130	75	82	123	122	96	102	-	Probably near fully
	Skipjack	Japan, USA, Philippines, Mexico, Indonesia	1500?	285	391	556	633	559	571	563	Moderate
	Billfishes	Japan, other	60?	70	44	44	48	45	47	47	Possibly heavy (i.e., blue marlin)
						1229	**1300**	**1215**	**1200**		

a/ Atlantic data from ICCAT Bulletins. Indian Ocean and Pacific data from FAO Yearbook of Fisheries Statistics
b/ Depends on strength of recruitment, which appears highly variable
c/ Longline stocks are heavily exploited. Figures of potential are for this fishery only
d/ No ocean-wide estimate of potential covering all sizes and methods of capture available
e/ Includes S. Bluefin caught in the Pacific and Atlantic
f/ Provisional figures